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NOTEWORTHY VASCULAR PLANT COLLECTIONS ON THE ANGELINA AND SABINE NATIONAL FORESTS, TEXAS

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ABSTRACT

Fifty-five species recognized as sensitive, threatened, and endangered by the National Forests and Grasslands in Texas occur on the Angelina and Sabine National Forests. Over the past decade, surveys have been undertaken by botanists and ecologists to locate many of these species. In this paper we annotate and document those species.

KEY WORDS: rare, threatened, endangered plants, Angelina National Forest, Sabine National Forest, Texas.

INTRODUCTION

There are a number of rare plant lists produced by different agencies in Texas. Among these are the Texas Organization for Endangered Species (TOES), Texas Natural Heritage Program (TNHP), and National Forests and Grasslands in Texas (NFGT). The lists do not necessarily contain the same species, nor are they static. For example, *Burmannia biflora* L. is on neither the TOES nor the TNHP list but is on the NFGT list. *Platanthera nivea* (Nutt.) Luer and *P. lacera* (Michx.) G. Don are on the TOES list, *Platanthera integra* (Nutt.) A. Gray *ex* Beck and *P. ciliaris* (L.) Lindl. are on the NFGT list, but no *Platanthera* is on the TNHP list. On the other hand, *Cypripedium kentuckiense* C.F. Reed is on all the lists. TOES and TNHP monitor only about 35% of the species on the NFGT list.

When we began our surveys for rare NFGT species in 1995, the NFGT rare plant list was underdocumented. We decided to review herbarium collections, the published and unpublished literature, and agency records (including TOES and TNHP) on species occurrences for the Angelina (ANF) and Sabine (SNF) National forests. The last time a review was undertaken was in the late 1980's when Orzell (1990) surveyed the entire NFGT. Since then many new rare species have been found on the Forests, new sites for previously monitored species have been discovered, herbarium searches have uncovered unreported specimens, and the rare plant list has been upgraded (NFGT 1994).

Over the past few years, a number of surveys of localized and specialized habitats have been conducted on Forest Service land, one aim of which has been to gather data on rare plant species (MacRoberts & MacRoberts 1996a, 1997). A large body of data on these species and their distribution now exists, which should be made accessible in order to further understanding of plant ecology in the West Gulf Coastal Plain (WGCP).

Therefore, like Bridges & Orzell (1989), we turn from the macro-distribution of species as reported in atlases, checklists, or floras (*e.g.*, Correll & Johnston 1970; Nixon & Kell 1993; Hatch *et al.* 1990; Jones *et al.* 1997) to the micro-distribution in the existing landscape. Knowledge of locally rare species aids in pinpointing rare and vanishing habitat as well as assessing the conservation value (rarity, diversity, and representativeness) of an area (Bourgeron *et al.* 1995; Diamond *et al.* 1997).

One thing we discovered during this study -- a point that Bridges & Orzell (1989) emphasized in their paper -- is that the east Texas flora is understudied and underdocumented, a point underscored by examination of herbarium collections. Notably lacking are studies of the herbaceous flora, either general county studies or studies of particular habitats.

Another point to keep in mind for the present discussion: these surveys by no means provide a complete or definitive inventory of rare species on the NFGT but merely touch the surface. They have targeted the most promising botanical areas, but even here, in most instances only one pass has been made through the site. Long-term monitoring of community, species, or populations has yet to be undertaken on the NFGT. Consequently, this document is not a final or definitive report or summary, but is instead a preliminary indication of the botanical resources on the NFGT, which we are only beginning to understand.

METHODS

The project targeted species on the NFGT rare plant species list. The list we used was dated 1994 (NFGT 1994) and was a substantial update since the late 1980's (Orzell 1990). To provide documentation for the NFGT list of rare species, we compiled all records from published and unpublished lists, notably from Orzell (1990), TOES, and TNHP. We combed the NFGT files and compiled all records we could find there, including unpublished reports (Singhurst 1996), herbarium searches by Carr (1992), and draft Element Steward Abstracts by Grace (1993).

We conducted field surveys of the ANF and SNF between 1995 and 1997. These surveys were assisted by Robert E. Evans, NFGT Forest Ecologist. We recorded about 250 EOR (Element Occurrence Record) sheets on 40 threatened, endangered, and sensitive (TES) species representing 321 site records. These are deposited with the NFGT. We deposited 165 voucher sheets, documenting 39 TES species, in ASTC, BRCH, DEK, LSUS, NLU, LSU, SFRP, TEX, and VDB.

With one major exception, we avoided resurveying areas that had been investigated by earlier workers. We did not collect very rare species, such as *Cypripedium kentuckiense* or *Spiranthes parksii* Correll. The former is unmistakable; the latter was determined by an expert from a single collected flower and in the field by an orchid expert.

In 1996 and 1997, we reviewed the collections at ASTC, BRIT, SBSC, SHST, TEX, and VDB. We also reviewed all available reports, published papers, EOR records, and agency documentation to obtain as accurate a picture as possible of rare plant distribution on the NFGT. In 1997, we documented many unvouchered reports by collecting specimens from areas where species had been reported but where there was no voucher.

FORMAT

The format of this paper is basically the same as that of our previous synthesis of rare plant species occurring on the Kisatchie National Forest (KNF) (MacRoberts & MacRoberts 1995a). Our purpose here is the same: to document species occurrences and to make available information that is often unavailable because it is buried in herbaria, in unpublished reports, and in agency notes. Since about half the plants on the KNF rare plant list are also on the NFGT list, those accounts are also germane.

When documenting species occurrences, we follow a general order of merit beginning with the best sources available. We consider voucher specimens that we have examined to be the best documentation; in their absence, we give one or more unverified literature references and/or ETS (endangered, threatened, and sensitive) and EOR (Element Occurrence Record) sheets on file with various organizations.

We wish to emphasize the importance of our cited sources to the production of this work and to point out that much more information is contained in them than is reported here; the serious student should consult them. Notable is Bridges & Orzell's (1989) paper on noteworthy rare species of the WGCP, Orzell's (1990) survey of NFGT, Singhurst's (1996) study of nine rare east Texas species, and records of the TNHP, TOES, and NFGT.

Specific plant locations are reported in Orzell (1990), Singhurst (1996) and in our EOR sheets on file at the NFGT, Lufkin, Texas, and at Bog Research, Shreveport, Louisiana.

Our intention here is not to give an historical summary of collections and collectors in the NFGT but rather to provide information relating to occurrence.

Currently, the NFGT rare plant list consists of 55 verified species for the ANF and SNF. We list and discuss each by family. We do not give every location where the species has been found but simply locate the species by county and general area within the Forest. We also give the general community type in which the species occurs, following the community classification of Diamond *et al.* (1987) as used by TNHP (1993) and TOES (1992). Information on specific site locations can be obtained from Orzell (1990), Singhurst (1996), and from data sheets available from the TNHP, TOES, and NFGT.

When a species is monitored by an agency (TNHP, TOES, NFGT), an ! follows the agency acronym.

Taxonomic nomenclature follows Jones *et al.* (1997).

LOCATION

The ANF and SNF are in east Texas and constitute about half of the NFGT. SNF consists of about 64,000 ha and the ANF of about 62,500 ha (Figs. 1-3). Both Forests occur in the gently rolling or hilly country of the pineywoods region. The highest elevation is about 170 m: the lowest creek bottoms are only about 30 m. The area is dissected by many small streams that feed into two large rivers: the Sabine and Angelina, which have been impounded to form Toledo Bend Reservoir on the east side of Sabine National Forest and Sam Rayburn Reservoir in the middle of the Angelina National Forest. Extensive pine and pine-hardwood forests and hardwood bottoms characterize the landscape, within which are many inclusional communities such as bogs, baygalls, sandylands, and barrens.

Both Forests are in the most mesophytic area of Texas. Rainfall averages about 100 cm annually and is fairly evenly distributed through the year. Other forms of precipitation such as sleet, ice, or snow are extremely rare. Summer rainfall is associated with thunderstorms, which produce lightning-induced ground fires that in presettlement times probably burned over the area every three to five years. Summers are hot and humid with temperatures often exceeding 32° C; winter temperatures seldom fall below -5° C and there are few days of frost.

The east Texas pineywoods represent the southeastern extent of the eastern forests and in particular the southern pinelands, notably the longleaf system. Most genera and species in this region are also found east and northeast of Texas (Correll & Johnston 1970; Nixon & Cunningham 1985; Harcombe *et al.* 1993; Ware *et al.* 1993).

Information on geology and soils can be found in Orzell (1990), Harcombe *et al.* (1993), Stout & Marion (1993), and Ware *et al.* (1993).

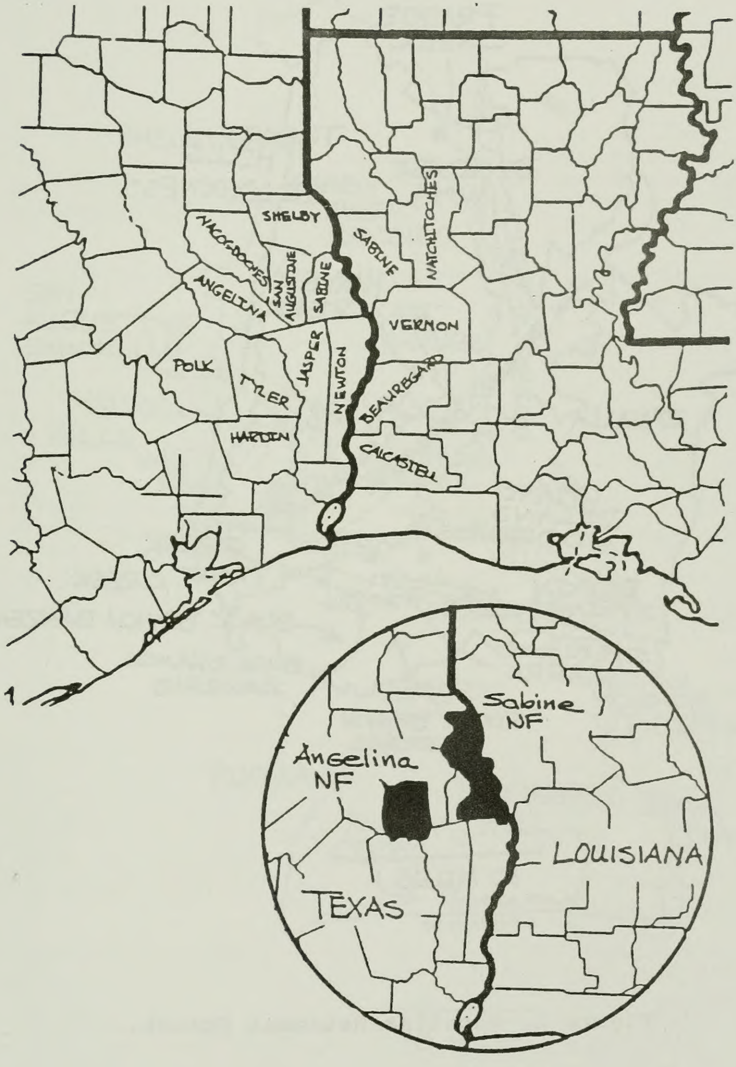

Figure 1. Location of Angelina and Sabine National Forests.

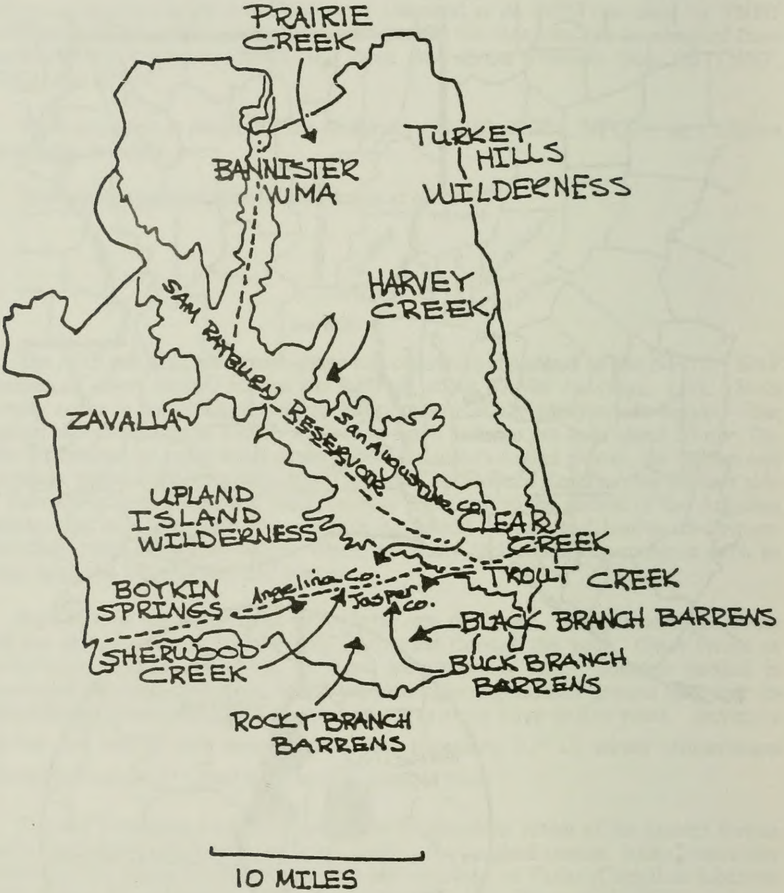

Figure 2. Angelina National Forest.

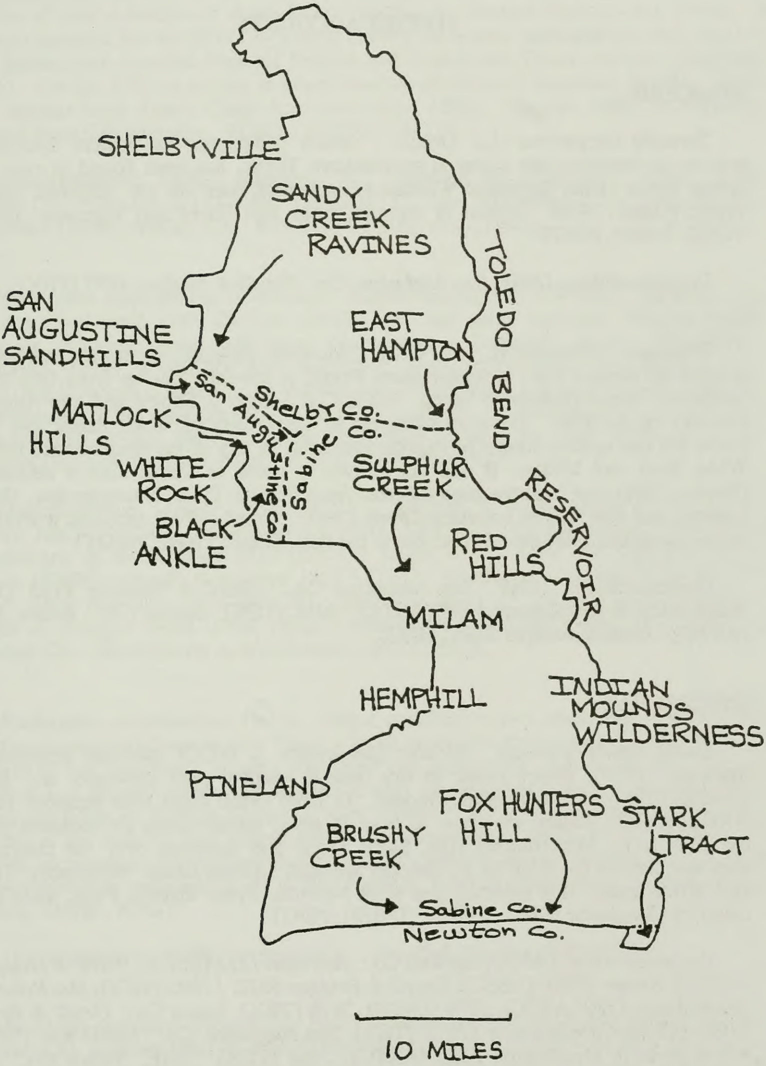

Figure 3. Sabine National Forest.

SPECIES ACCOUNTS

APIACEAE

Taenidia integerrima (L.) Drude. Yellow pimpernel, an eastern species that reaches its southwestern extent in southeastern Texas, has been found in one mesic ravine forest in the Bannister Wildlife Management Area on the Angelina National Forest (Orzell 1990). It also is reported from Red River and Harrison counties. TOES, TNHP, NFGT!

Documentation: (ANF, San Augustine Co.: *Orzell & Bridges 4977* [TEX]).

Thaspium trifoliatum (L.) A. Gray. Meadow parsnip, an eastern species that reaches its western limit in southeastern Texas, is currently known from four beech-hardwood ravines (American Beech - White Oak Series) in Sabine and San Augustine counties on the SNF. These locations are in the vicinity of Black Ankle and White Rock, but this species should be expected to occur in any of the deep ravines between White Rock and Milam. It was not known to occur in Texas until a decade ago (Brown 1986a) but has now been reported from Sabine, Tyler, Nacogdoches, Hardin, Liberty, and San Jacinto counties (Orzell 1990). Orzell (1990) reported it from two locations on the SNF; we add one site to the list. TOES, TNHP, NFGT!

Documentation: (SNF, San Augustine Co.: *Orzell & Bridges 9193* [TEX]; *MacRoberts & MacRoberts 3038* [ASTC], *3037* [TEX]; Sabine Co.: *Nixon 15181* [ASTC]; *Orzell & Bridges 5096* [TEX]).

ASTERACEAE

Liatris tenuis Shinners. Slender gay-feather, a WGCP endemic described by Shinners (1959), favors mesic to dry upland longleaf pine savannas and forests (Longleaf Pine - Little Bluestem Series). In 1990 Orzell listed nine locations for the ANF and SNF. Today, we know of over 24 sites, mainly along the southern part of the SNF (*e.g.*, Fox Hunters Hill, Stark Tract) and scattered over the central and southern parts of the ANF (*e.g.*, Boykin Springs, Upland Island Wilderness, Turkey Hill Wilderness). It is reported also from Newton, Tyler, Hardin, Polk, and Orange counties (Singhurst 1996). TOES!, TNHP!, NFGT!

Documentation: (ANF, Angelina Co.: *Amerson 1231* [SMU]; *Ward & Hupp 376* [ASTC]; *Brown 10600* [SBSC]; *Orzell & Bridges 5622, 11093* [TEX]; *MacRoberts & MacRoberts 2820* [ASTC], *2479* [LSUS], *2819* [TEX]; Jasper Co.: *Orzell & Bridges 11073* [TEX]; *Carr & Evans 12113* [TEX]; San Augustine Co.: *Evans s.n.* [SBSC]; *MacRoberts & MacRoberts 2865* [ASTC], *2864* [TEX]. SNF, Sabine Co.: *Fritz 125879* [SMU]; *Orzell & Bridges 5640* [TEX]; *MacRoberts & MacRoberts 2793, 2795, 2797* [ASTC], *2796* [BRCH], *2792* [LSUS], *3212* [TEX]).

Prenanthes barbata (Torr. & Gray) Milstead. Rattlesnake root, a southeastern species of mixed hardwood slope forest, reaches its western limit in east Texas. It was not reported for the NFGT by Orzell (1990) but is now recorded for nine sites on the Sabine and Angelina National Forests and twelve east Texas counties (Singhurst 1996). On the SNF, it occurs in beech-hardwood ravines (American Beech - White Oak Series) from Sandy Creek Ravines to Red Hills. On the ANF, it occurs in Upland Island Wilderness. TOES!, TNHP!, NFGT!

Documentation: (ANF, Angelina Co.: Reported by Singhurst [1996]. SNF, Sabine Co.: *Nesom S-11S-130, 131* [SHST]; San Augustine Co.: Reported by Singhurst [1996]; Shelby Co.: Reported by Singhurst [1996]).

Rudbeckia scabrifolia L.E. Brown. Sabine coneflower, a WGCP endemic, was not described until 1986 (Brown 1986b). It has been reported from numerous baygalls, wooded seeps, and bogs (Sphagnum - Beakrush Series, Sweetbay - Magnolia Series) on both the ANF and SNF, often occurring in large numbers. In 1990 Orzell reported 26 sites. To this we can add 20 sites. The bogs and baygalls are concentrated in the southern half of the ANF south of the Sam Rayburn Reservoir in such areas as Boykin Springs; on the SNF, they occur in the very south, *e.g.*, Fox Hunters Hill and the Stark Tract. TOES!, TNHP!, NFGT!

Documentation: (ANF, Angelina Co.: *Correll & Wasshausen 27533* [TEX]; *Brown 10656* [SBSC], *Nixon & Ward 9790* [ASTC]; *Orzell & Bridges 5624* [TEX]; *MacRoberts & MacRoberts 2822* [ASTC]; Jasper Co.: *Ward 569* [ASTC]; *Brown 10652* [SBSC]; *Orzell & Bridges 11057* [TEX]; *MacRoberts & MacRoberts 2569, 2571, 2580* [ASTC], *2901* [BRCH]. SNF, Sabine Co.: *Brown 17777* [SBSC]; *Orzell & Bridges 5658, 5904* [TEX]; *MacRoberts & MacRoberts 3374* [ASTC]; Newton Co.: *MacRoberts & MacRoberts 3372* [TEX]).

Rudbeckia subtomentosa Pursh. Sweet coneflower is a midwestern species that reaches its southern limit in east Texas. In its more northern range, it apparently is a species of low meadows, prairies, and open low woodlands, but in the ANF its only location is a slightly seepy area between a bog, an acid seep forest, and a dry mesic forest just north of Boykin Springs (Orzell 1990). This is not surprising since many species at the ends of their ranges will inhabit somewhat "atypical" communities. It will be necessary to locate more examples of this species in east Texas to determine its local community association. It is also reported from Hardin County (Orzell 1990). TOES, TNHP, NFGT!

Documentation: (ANF, Angelina Co.: *Orzell & Bridges 8342* [TEX]).

Solidago auriculata Shuttlw. *ex* Blake. Eared goldenrod, a southeastern species reaching its western limit in east Texas, can be quite common in beech-hardwood ravines (American Beech - White Oak Series), notably in the less sandy areas of the ANF and SNF. Although we have recorded it from many areas of the SNF, it is particularly common in the beech-hardwood ravines between Sandy Creek Ravines and Red Hills. On the ANF, it is common in small ravines just north of Harvey

Creek. We have recorded it from 37 locations; Orzell (1990) makes frequent mention of it. TOES, TNHP, NFGT!

Documentation: (ANF, San Augustine Co.: *MacRoberts & MacRoberts 2847, 2868* [ASTC], *2826* [TEX], *3394* [TEX]. SNF, Sabine Co.: *Brown 9385* [ASTC]; *MacRoberts & MacRoberts 2737* [BRCH], *2766* [LSUS], *2738* [ASTC]; San Augustine Co.: *MacRoberts & MacRoberts 2825* [ASTC], *3035* [TEX], *3395* [LSU]; Shelby Co.: *Orzell & Bridges 5119* [TEX]).

Tetragonotheca ludoviciana (Torr. & Gray) A. Gray *ex* Hall. Louisiana squarehead, a WGCP endemic, is reported from nineteen east Texas counties (Orzell 1990). It is local in upland xeric sandhill habitat (Longleaf Pine - Little Bluestem Series, Bluejack Oak - Pine Series). Orzell (1990) reported it from two ANF sites. We add thirteen sites for both forests. It occurs in deep xeric sands and so has a disjunct distribution. Populations are to be found at Upland Island and at San Augustine Sandhills. TOES, TNHP, NFGT!

Documentation: (ANF, Angelina Co.: *Ward & Hupp 486* [ASTC]; *Orzell & Bridges 10639* [TEX]; Jasper Co.: *MacRoberts & MacRoberts 2570, 2848* [ASTC]; San Augustine Co.: *Evans 3002* [to be deposited ASTC]. SNF, San Augustine Co.: *MacRoberts & MacRoberts 2644* [ASTC], *2645* [BRCH]).

BORAGINACEAE

Lithospermum tuberosum Rugel *ex* DC. Tuberous gromwell, a southeastern species of calciphilic hardwood slope forests that reaches its western limit in east Texas, is known from only one Sabine National Forest record at Sandy Creek Ravines (American Beech - White Oak Series) (Orzell 1990). It is known also from Brazoria, Nacogdoches, Polk, San Jacinto, Liberty, and Tyler counties (Orzell 1990). TOES, TNHP, NFGT!

Documentation: (SNF, Shelby Co.: *Orzell & Bridges 5127* [TEX]; *Evans 3003* [to be deposited ASTC]).

BRASSICACEAE

Cardamine concatenata (Michx.) Swartz. (SYN = *Dentaria laciniata* Muhl. *ex* Willd.). Toothwort, an eastern species that finds its southwestern limit in east Texas, is known from Sabine and San Augustine counties (Orzell 1990). It is found in the central section of the SNF between Black Ankle, East Hamilton, and Milam in beech-hardwood ravine communities (American Beech - White Oak Series), often locally in large numbers. It was first collected in Texas in 1962 (Correll 1972). Orzell (1990) listed it for two sites. We have added one site. TOES, TNHP, NFGT!

Documentation: (SNF, Sabine Co.: *Orzell & Bridges 4968* [TEX]; *MacRoberts & MacRoberts 2968* [ASTC]).

BURMANNIACEAE

Apteria aphylla (Nutt.) Barnh. *ex* Small. Nodding-nixie, a southeastern saprophyte reaching its western limit in east Texas, grows in baygalls and damp, deeply shaded stream edges (Sweetbay Magnolia Series). It is known from eight counties. Orzell (1990) recorded it for five NFGT sites. We have found it at an additional nineteen sites. It is most common in the southern part of the SNF, *e.g.*, Fox Hunters Hills, and on the ANF in the Boykin Springs area. It can be common locally, but it is inconspicuous and must be looked for in the summer and fall. TOES, TNHP, NFGT!

Documentation: (ANF, Angelina Co.: *Ward 903* [ASTC]; *Orzell & Bridges 11445* [TEX]; *Peterson 331* [SBSC]; Jasper Co.: *Ward 765* [ASTC]; *Orzell & Bridges 8363* [TEX]; *MacRoberts & MacRoberts 2778* [ASTC,BRCH] *2930* [LSUS,TEX]. SNF, Newton Co.: *MacRoberts & MacRoberts 3371* [TEX]; Sabine Co.: *MacRoberts & MacRoberts 3373* [TEX]).

Burmannia biflora L. Northern burmannia is a coastal plains species that reaches its western limit in the bogs and baygalls of east Texas. On the ANF, it occurs in baygalls (Sweetbay Magnolia Series) along the Angelina-Jasper county line. TOES, TNHP, NFGT!

Documentation: (ANF, Angelina Co.: *Ward 820* [ASTC]; Jasper Co.: *Ward 826* [ASTC]).

CARYOPHYLLACEAE

Loeflingia squarrosa Nutt. Spreading loeflingia, a western species that is rare in the WGCP, is known from only one National Forest site. This is in the deep xeric sandhills (Bluejack Oak - Pine Series) in southern Shelby County above Sandy Creek Ravine north of San Augustine. TOES, TNHP, NFGT!

Documentation: (SNF, Shelby Co.: *Orzell & Bridges 5132* [TEX]; *MacRoberts & MacRoberts 3294* [ASTC]).

Paronychia drummondii Torr. & Gray. Drummond's nailwort, a Texas near-endemic, that reaches its eastern limit in western Louisiana, is found in upland xeric sandylands (Bluejack Oak - Pine Series). Its exact distribution in Texas is unclear. Correll & Johnston (1970) describe it as occurring from Aransas Co. eastward, but it also occurs in east central Texas, eastern Oklahoma (Taylor & Taylor 1989), and western Louisiana (MacRoberts & MacRoberts 1995a). It is apparently known from only two or three sites, all on the SNF. One notable site is the San Augustine Sandylands (MacRoberts & MacRoberts 1996a). TOES, TNHP, NFGT!

Documentation: (SNF, San Augustine Co.: *MacRoberts & MacRoberts 2647* [ASTC], *3397* [TEX]; Shelby Co.: *Orzell & Bridges 5133* [TEX]).

Silene subciliata B.L. Robinson. Scarlet catchfly, a WGCP endemic, is known from several locations in southeast SNF (Fox Hunters Hill, Stark Tract) (Orzell 1990; Carr 1991). It also is reported for Hardin, Jasper, Jefferson, Liberty, Polk, Shelby, and Tyler counties (TNHP 1995; TOES 1993; Carr 1991). It occurs in deep sandy soils and along the margins of fire maintained dry upland longleaf pine savannas (Bluejack Oak - Pine Series, Longleaf Pine - Little Bluestem Series). On the NFGT, it is known from a few sites in southern Sabine County (Fox Hunters Hill, Stark Tract) and northern Newton County (Stark Tract). TOES!, TNHP!, NFGT!.

Documentation: (SNF, Newton Co.: *Orzell & Bridges 5909* [TEX]; *MacRoberts & MacRoberts 3472* [ASTC]; Sabine Co.: *Carr 10818* [TEX]; *MacRoberts & MacRoberts 3471* [ASTC]).

CYPERACEAE

Carex basiantha E. von Steudel (*Carex willdenowii* Schkuhr *ex* Willd. = misapplied name) (see Jones *et al.* 1997; Naczi *et al.* 1998). This *Carex* reaches its western limit in eastern Texas. Bridges & Orzell (1989) report it under the name *C. willdenowii* from fourteen counties in eastern Texas (see also Naczi *et al.* 1998). Its habitat appears to be beech-hardwood ravines (American Beech - White Oak Series). Apparently, there are no recent records of this species from the NFGT, but Bridges & Orzell (1989) report it from widely scattered locations. Based on recent field work in central Louisiana and southern Arkansas, Philip Hyatt (pers. comm.) believes *C. basiantha* is probably more common than collections document in eastern Texas; he found it at a single site in appropriate habitat in Nacogdoches County. According to Stanley Jones (pers. comm.), it is a common caric-sedge of the east Texas forest community. TOES, TNHP, NFGT!

Documentation: (ANF, Angelina Co.: Reported by Bridges & Orzell [1989]; San Augustine Co.: *Orzell & Bridges 4980, 4990* [TEX]. SNF, Sabine Co.: *Orzell & Bridges 4970, 6177* [TEX]; Shelby Co.: *Orzell & Bridges 5118* [TEX]).

Carex styloflexa Buckl. Bent sedge, an eastern species that finds its southeastern limit in eastern Texas, is known from Jasper and Angelina counties (Orzell 1990). On the ANF it is known from only two spring-fed streamsides in ravines with forested seeps in Boykin Springs and Trout Creek (Sweetbay Magnolia Series). TOES, TNHP, NFGT!

Documentation: (ANF, Angelina Co.: Reported by Orzell 1990; Jasper Co.: Reported by Orzell 1990, Specimens apparently collected, but not seen at TEX [see also Carr (1992)]. SNF, Sabine Co.: *Jones 9918* [BRIT]).

Cyperus grayioides Mohlenbrock. Mohlenbrock's umbrella sedge was not recognized as a distinct species until 1959 (Mohlenbrock 1959). Carter & Bryson (1991) consider it a mid-continent xeric sandhills species that reaches its southern limit in east Texas. It is now known from about 22 east Texas counties and five Louisiana parishes. Orzell (1990) reported it from four NFGT sites; we can add six to that number. It is found in such places as the deep sands of the Stark Tract, the San

Augustine Sandhills, and near the headwaters of Shearwood Creek (Bluejack Oak - Pine Series, Longleaf Pine - Little Bluestem Series). TOES!, TNHP!, NFGT!

Documentation: (ANF, Angelina Co.: *Orzell & Bridges 11091* [TEX]; Jasper Co.: *MacRoberts & MacRoberts 2686, 2791* [ASTC]. SNF, Newton Co.: *Orzell & Bridges 5907* [TEX]; San Augustine Co.: *Orzell & Bridges 5913* [TEX]; *MacRoberts & MacRoberts 2668* [ASTC], *2782* [BRCH], *2706* [TEX]; Shelby Co.: *Orzell & Bridges 5919* [TEX]).

Rhynchospora macra (C.B. Clarke) Small. Large beakrush, a coastal plain species that reaches the periphery of its range in east Texas, is fidel to bogs (Sphagnum - Beakrush Series). It is currently known from two sites on the Angelina National Forest (Boykin Springs and Clear Creek), but further searches will undoubtedly reveal more locations. TOES, TNHP, NFGT!

Documentation: (ANF, Angelina Co.: *Ward 873* [ASTC]; *Orzell & Bridges 8337, 8347, 8353* [TEX]; *Brown 18117* [SBSC]; Jasper Co.: *Ward 630* [ASTC]; *Orzell & Bridges 8374, 8376* [TEX]; *MacRoberts & MacRoberts 2823* [ASTC]).

ERIOCAULACEAE

Eriocaulon texense Korn. Texas pipewort, is a bog species that ranges from Florida to east Texas. It has been located at six bog sites on the two forests, such as the Trout Creek area (Sphagnum - Beakrush Series). TOES, TNHP, NFGT!

Documentation: (ANF, Angelina Co.: *Correll & Correll 27216* [SMU]; *Nixon & Cox 7784* [ASTC]; *Orzell & Bridges 6221* [TEX]; *Orzell & Bridges 5076* [VDB]; *Brown 5676* [SBSC]; *Schultz s.n.* [SBSC]; Jasper Co.: *Ward 704* [ASTC]; *Orzell & Bridges 9096* [TEX]; *Orzell & Bridges 5089* [VDB]; *MacRoberts & MacRoberts 2652, 2589* [ASTC]. SNF, Sabine Co.: Reported by MacRoberts & MacRoberts [EOR on file NFGT]).

FABACEAE

Amorpha canescens Nutt. *ex* Pursh. Leadplant, a midwestern prairie species, occurs in sandy longleaf pine uplands on the ANF (Longleaf Pine - Little Bluestem Series). Orzell (1990) located it at two sites; we add eight others in the same general area around Clear Creek headwaters. It is known from at least twelve Texas counties (Carr 1992). According to Correll & Johnston (1970), it is infrequent or rare and local with a very peculiar disjunct distribution, occurring in sandy prairies in the western Panhandle, and again scattered in southeast and south central Texas, south to Aransas County. It is one of those species that seems to forsake its normal community association at the end of its range. TOES, TNHP, NFGT!

Documentation: (ANF, Angelina Co.: *Marietta & Nixon 236* [ASTC]; *Orzell & Bridges 11094* [TEX]; *Brown 17790* [SBSC]; Jasper Co.: *Jones & Jones 3198* [ASTC]; *MacRoberts & MacRoberts 2689* [ASTC]; San Augustine Co.: *Evans 3001* [to be deposited ASTC]).

Galactia erecta (Walt.) Vail. Erect milk pea is known from only a couple of locations, for example, Boykin Springs Longleaf, on the ANF (Longleaf Pine - Little Bluestem Series) (Orzell 1990). This coastal plains species reaches its western limit in southeast Texas. TOES, TNHP, NFGT!

Documentation: (ANF, Angelina Co.: *Marietta & Nixon 217* [ASTC]; Jasper Co.: Reported by Orzell [1990]).

Pediomelum hypogaeum (Nutt. *ex* Torr. & Gray) Rydb. [SYN = *Psoralea subulata* Bush]. Sand scurfpea is a WGCP endemic that occurs in Oklahoma, Arkansas, Louisiana, and Texas. We located it in six sites in sandy upland longleaf savanna and in xeric sandylands such as the headwaters of Clear Creek (Longleaf Pine- Little Bluestem Series, Bluejack Oak - Pine Series). TOES, TNHP, NFGT!

Documentation: (ANF, Angelina Co.: *Nixon 7823* [ASTC]; *Orzell & Bridges 9314* [TEX]; Jasper Co.: *MacRoberts & MacRoberts 3042* [ASTC]. SNF, San Augustine Co.: *MacRoberts & MacRoberts 3292* [TEX]; Shelby Co.: *Orzell & Bridges 5134* [TEX]; *MacRoberts & MacRoberts 3293* [ASTC]).

GENTIANACEAE

Bartonia texana Correll. Texas screwstem, a Texas endemic, has been reported from eight east Texas counties (Nixon & Ward 1981; TNHP 1993). To this we add two. It seems to prefer baygalls (Sweetbay Magnolia Series). TOES!, TNHP!, NFGT!

Documentation: (ANF, Angelina Co.: *MacRoberts & MacRoberts 3270* [BRIT]; Jasper Co.: *MacRoberts & MacRoberts 2912* [ASTC,BRCH]). There is a Nacogdoches Co. specimen, *Nixon & Ward 1200* [ASTC], from the SFA Experimental Forest about 11 miles south of Nacogdoches. This outlying area is apparently officially part of the ANF.

LILIACEAE

Erythronium rostratum W. Wolf. Yellow dogtooth violet, a south central U.S. species, finds its southeastern limit in beech-hardwood ravines in east Texas (American Beech - White Oak Series). Orzell (1990) reported two sites from Sabine County, and we can add four more from the same county. Typical sites are ravines near Red Hills and Sulphur Creek. It has been recorded only from two additional counties in east Texas (San Augustine and Tyler) (Orzell 1990). TOES, TNHP, NFGT!

Documentation: (SNF, Sabine Co.: *Orzell & Bridges 4969, 6214* [TEX]; *MacRoberts & MacRoberts 2970* [ASTC]).

Lilium michauxii Poir. Carolina lily, a southeastern species reaching its western limit in east Texas, is known from four east Texas counties. Orzell (1990) records it for twelve NFGT sites; we add 30 sites. It can be found in a number of communities from beech-hardwood to mesic hardwoods (American Beech - White Oak Series, Sweetbay Magnolia Series). TOES, TNHP, NFGT!

Documentation: (ANF, Angelina Co.: *Watson s.n.* [TEX]; *Orzell & Bridges 11433* [TEX]; *MacRoberts & MacRoberts 2624, 2572, 2863* [ASTC]; *Schultz 344* [SBSC]; Jasper Co.: *MacRoberts & MacRoberts 3040, 3304* [TEX], *3305* [ASTC]; San Augustine Co.: *MacRoberts & MacRoberts 3393* [TEX]. SNF, Newton Co.: Reported by Orzell [1990]; Sabine Co.: *Ward 920* [ASTC]; *Orzell & Bridges 5637* [TEX]; *Schultz 476* [SBSC]; *MacRoberts & MacRoberts 3349* [ASTC], *3375* [TEX]; San Augustine Co.: *MacRoberts & MacRoberts 3396* [TEX]; Shelby Co.: Reported by Orzell [1990]).

Schoenolirion wrightii Sherman. Texas sunnybells, an unusual species with disjunct populations from Alabama, Arkansas, Louisiana, and Texas, occurs in open barrens and rocky outcrops (Little Bluestem - Nuttall's Rayless Goldenrod Series) (MacRoberts & MacRoberts 1995a). According to Orzell (1990), although it has been recorded for several central Texas counties, Jasper County is currently the only county from which it is known to occur in southeast Texas. Here it is only known from the Black Branch Barrens area (Nixon *et al.* 1980; Nixon & Ward 1981; Marietta 1979; Marietta & Nixon 1984; Orzell 1990). TOES, TNHP, NFGT!

Documentation: (ANF, Jasper Co.: *Marietta & Nixon 61* [ASTC]; *Orzell & Bridges 9128* [TEX]; *Brown 7079* [SBSC]; *MacRoberts & MacRoberts 3316* [TEX]).

Trillium gracile J.D. Freeman. Slender wake-robin, a WGCP endemic that can be locally abundant, has been recorded for eight east Texas counties (Freeman 1969; Nixon *et al.* 1970; Orzell 1990). It is frequently found in beech-hardwood slopes (American Beech - White Oak Series), typical sites being those occurring between Black Ankle and Red Hills. Orzell (1990) reports twelve sites on the ANF and SNF. To this we can add sixteen sites. TOES, TNHP, NFGT!

Documentation: (ANF, Angelina Co.: *MacRoberts & MacRoberts 2863* [ASTC]; Jasper Co.: Reported by Orzell [1990]; San Augustine Co.: *Warnock 9596* [SHST]; *Schultz 432* [SBSC]; *Nixon 13652* [ASTC]; *Orzell & Bridges 4985* [TEX]. SNF, Sabine Co.: *Kessler 3240* [SHST]; *Orzell & Bridges 6185, 6212* [TEX]; *MacRoberts & MacRoberts 2987* [ASTC], *2971* [TEX]; *Brown 9779* [SBSC]; San Augustine Co.: *Orzell & Bridges 9195* [TEX]; *MacRoberts & MacRoberts 3034* [TEX]; Shelby Co.: *Orzell & Bridges 5123* [TEX].

Trillium texanum Buckl. Texas trillium, a WGCP endemic, is currently reported from nine east Texas counties (Singhurst 1996; Nixon *et al.* 1977). It was not found on the NFGT until 1993 and is now known from eight locations, all in the headwaters of Clear Creek, Buck Branch, and Trout Creek. On the ANF, it occurs in baygalls (Sweetbay Magnolia Series). TOES!, TNHP!, NFGT!

Documentation: (ANF, Angelina Co.: *Schultz 434* [SBSC,TEX]; *MacRoberts & MacRoberts 3225* [ASTC]; Jasper Co.: *MacRoberts & MacRoberts 2592, 3005* [ASTC]).

Uvularia perfoliata L. Perfoliate bellwort, an eastern species that is peripheral in east Texas, was not reported for the state until a decade ago (Nixon *et al.* 1987). It occurs in beech-hardwood ravines (American Beech - White Oak Series), for example, those between Black Ankle and Red Hills. Orzell (1990) reports it from seven locations; we add four. TOES!, TNHP, NFGT!

Documentation: (SNF, Sabine Co.: *Nixon 15840* [ASTC]; *Orzell & Bridges 4965, 9177, 9223* [TEX]; *MacRoberts & MacRoberts 2998* [TEX]; *Brown 8615* [SBSC]; San Augustine Co.: *Orzell & Bridges 9209* [TEX]; *MacRoberts & MacRoberts 3032* [ASTC]; Shelby Co.: *Orzell & Bridges 9261* [TEX]).

LYCOPODIACEAE

Palhinhaea cernua (L.) Vasconcellos & Franco (SYN = *Lycopodium cernuum* L.). Nodding club-moss, a Gulf Coastal Plain species, reaches its western limit in east Texas. Its only known Texas location is the ANF in the headwaters of Shearwood Creek (MacRoberts & MacRoberts 1995b). It is a bog species (Sphagnum - Beakrush Series). TOES, TNHP, NFGT!

Documentation: (ANF, Jasper Co.: *MacRoberts & MacRoberts 2860* [ASTC, BRCH,LSUS,TEX,VDB]).

MAYACACEAE

Mayaca fluviatilis Aubl. (SYN = *Mayaca aublettii* Michx.). Bog moss is a coastal plains species that reaches its range limit in east Texas. It occurs in shallow pools in baygalls (Sweetbay Magnolia Series). We know it in ANF from two locations, and Orzell (1990) records it from one. All known locations are in the vicinity of the Angelina/Jasper county border south of the Sam Rayburn Reservoir. TOES, TNHP, NFGT!

Documentation: (ANF, Angelina Co.: *Ward 1131* [ASTC]; *Orzell & Bridges 8308* [TEX]; *MacRoberts & MacRoberts 2574* [ASTC], *2882* [BRCH]; Jasper Co.: *Turner 76* [TEX]; *Ward 770* [ASTC]; *Peterson 330* [SBSC]; *MacRoberts & MacRoberts 2913* [ASTC]).

ORCHIDACEAE

Calopogon tuberosus (L.) B.S.P. Grasspink, an eastern species reaching its western limit in east Texas, is a bog and baygall species (Sweetbay Magnolia Series, Sphagnum - Beakrush Series). It has been recorded from about thirteen counties in east Texas (Goldman, pers. comm.). Orzell (1990) records fourteen locations on the ANF; we add eleven from both forests. Typical locations are the bogs in Boykin

Springs, Angelina County, and bogs in Fox Hunters Hill in southern Sabine County. Recent taxonomic reassessment of species boundaries in *Calopogon* may result in certain revisions, but all plants occurring in bogs and bog-like habitat on the NFGT appear to be *C. tuberosus* (Goldman 1995). TOES, TNHP, NFGT!.

Documentation: (ANF, Angelina Co.: *Marietta et al. 211* [ASTC]; *Schultz s.n.* [SBSC]; Jasper Co.: *Ward & Hupp 107* [ASTC]; *MacRoberts & MacRoberts 2639* [ASTC]. SNF, Sabine Co.: *MacRoberts & MacRoberts 3314* [TEX]).

Cypripedium kentuckiense C.F. Reed. Southern lady's slipper, a south central species reaching its southwestern limit in east Texas, has previously been reported from six counties (Singhurst 1996). It is a species that favors shaded areas in beech-hardwood slopes (American Beech - White Oak Series), for example, from Black Ankle to Red Hill (Orzell 1990). Singhurst reported seven NFGT locations. We add one to that list in Shelby County. Unfortunately, most populations consist of only one or a few stems. Clearly, the species is vanishing from our flora. TOES!, TNHP!, NFGT!

Documentation: (ANF, San Augustine Co.: *Orzell & Bridges 10733* [TEX]. SNF, Sabine Co.: *Nixon & Ward 10667* [ASTC]; *Orzell & Bridges 9164, 9221, 9222* [TEX]; San Augustine Co.: Reported by Singhurst [1996]; Shelby Co.: Reported by MacRoberts & MacRoberts [EOR on file NFGT]).

Isotria verticillata (Muhl. *ex* von Willd.) Raf. Whorled pogonia, a northeastern species that reaches its western extension in east Texas, is recorded from Cass, Newton, Polk, Sabine, and Tyler counties (Orzell 1990). Orzell (1990) reported it for one location on the SNF, in Matlock Hills. To this we add two Jasper County (Buck Branch) and one San Augustine County (Prairie Creek) location, where it occurs in moist woods along stream courses. The species is known to occur in baygalls and in beech-hardwood ravines (American Beech - White Oak Series, Sweetbay Magnolia Series). TOES, TNHP, NFGT!

Documentation: (ANF, Jasper Co.: *MacRoberts & MacRoberts 3008* [ASTC]; San Augustine Co.: *Evans et al. 3302* [TEX], *3303* [ASTC]. SNF, Sabine Co.: *Schultz 430* [SBSC]; *Orzell & Bridges 5098* [TEX]).

Platanthera ciliaris (L.) Lindl. Orange fringed orchid, an eastern species that reaches its western limit in east Texas, is locally common in bogs and baygalls (Sweetbay Magnolia Series, Sphagnum - Beakrush Series), for example, in the headwaters of Trout Creek and Clear Creek, and at Fox Hunters Hill. Because it is not monitored by the TNHP, TOES, or, until recently, was not monitored by the NFGT, it is difficult to determine its exact distribution. We located it at eight sites.

Documentation: (ANF, Angelina Co.: *Nixon et al. 530* [ASTC]; *Brown 10654* [SBSC]; *MacRoberts & MacRoberts 2883* [ASTC], *3459* [TEX]; Jasper Co.: *MacRoberts & MacRoberts 3470* [TEX]. SNF, Sabine Co.: *Walker et al. 103* [TEX], *103-A* [ASTC]; *MacRoberts & MacRoberts 3473* [ASTC]).

Platanthera integra (Nutt.) A. Gray *ex* Beck. Yellow fringeless orchid, a coastal plain species, is very rare in east Texas. It is known today from only a few bogs (Sphagnum - Beakrush Series) in Jasper and Angelina counties on the ANF at Boykin Springs (Orzell 1990). This species appears to be more common in Louisiana than in Texas (MacRoberts & MacRoberts 1990), but its populations are small throughout its range. TOES, TNHP, NFGT!

Documentation: (ANF, Angelina Co.: *Orzell & Bridges 8292* [TEX]; *Schultz 205* [SBSC]; Jasper Co.: *Orzell & Bridges 8289* [TEX]).

Pogonia ophioglossoides (L.) A.L. deJussieu. Rose pogonia, an eastern species that reaches its western limit in east Texas, occurs in bogs and at the open edges of baygalls (Sweetbay Magnolia Series, Sphagnum - Beakrush Series). Orzell (1990) has recorded fourteen sites on the ANF. We add ten locations to the ANF and one to the SNF. Typical sites are in the Boykin Springs area, the Clear Creek headwaters, and bogs at Fox Hunters Hill. TOES, TNHP, NFGT!

Documentation: (ANF, Angelina Co.: *Nixon & Cox 7948* [ASTC]; *Schultz s.n.* [SBSC]; *Correll & Correll 27218* [TEX]; *Correll & Ogden 25165* [TEX]; Jasper Co.: *Jones & Jones 2595* [ASTC]; *MacRoberts & MacRoberts 2638, 2590* [ASTC]. SNF, Sabine Co.: *MacRoberts & MacRoberts 3315* [TEX]).

Spiranthes parksii Correll. Navasota ladies'-tresses, an endangered Texas endemic, is known from ten Texas counties of which Jasper is an eastern outlier (Poole & Riskind 1987; Grace 1993). The ANF location was first recorded in 1986 in post oak dominated streamsides (Post Oak - Black Hickory Series [Diamond *et al.* 1987]) adjacent to Black Branch Barrens (Bridges & Orzell 1989; Orzell 1990), but the species had not been relocated at the original site. On October 27 and 28, 1996, we found two stems (in flower) at a site in the open barrens at Black Branch (Little Bluestem - Nuttall's Rayless Goldenrod Series; see description of this community in Marietta 1979; Marietta & Nixon 1984; Mohlenbrock 1993; Orzell 1990). It was relocated at the same site in November 5, 1997 (MacRoberts *et al.* in press). TOES!, TNHP!, NFGT!

Documentation: (ANF, Jasper Co.: *MacRoberts, MacRoberts, & Liggio 3290* [ASTC,TEX]. The whereabouts of the original Orzell specimen [*Orzell 4854*], which was deposited in TEX is unknown; several searches have failed to uncover it and it may yet remain unmounted.

PAPAVERACEAE

Sanguinaria canadensis L. Bloodroot, an eastern species that reaches its southwestern limit in east Texas, occurs in beech-hardwood slopes (American Beech - White Oak Series). It has been reported from nine counties in east Texas (Orzell 1990). Orzell reported four locations on the NFGT. We add six more. Common locations are in the ravines between Black Ankle and Red Hills. TOES, TNHP, NFGT!

Documentation: (ANF, San Augustine Co.: *Orzell & Bridges 4986* [TEX]. SNF, Sabine Co.: *Nixon et al. 426* [ASTC]; *Orzell & Bridges 4966* [TEX]; *MacRoberts & MacRoberts 2738* [ASTC]; San Augustine Co.: *MacRoberts & MacRoberts 3031* [TEX]; Shelby Co.: *Orzell & Bridges 5120* [TEX]).

POACEAE

Brachyelytrum erectum (Schreb.) Beauv. Bearded short-husk is an eastern species that is peripheral in east Texas where it occurs in beech-hardwood slopes (American Beech - White Oak Series) (Nixon *et al.* 1980). It is known from four Texas counties (Orzell 1990). Orzell (1990) reported it from four NFGT locations; we add eleven to this number. It can be found in deep ravines in the Red Hills area and north of Harvey Creek. TOES, TNHP, NFGT!.

Documentation: (ANF, San Augustine Co.: *MacRoberts & MacRoberts 2869* [ASTC]. SNF, Sabine Co.: *Orzell & Bridges 11199* [TEX]; *MacRoberts & MacRoberts 2885* [ASTC], *2867* [BRCH], *3213* [TEX]; San Augustine Co.: *Orzell & Bridges 11200* [TEX]; *MacRoberts & MacRoberts 3195* [TEX]; Shelby Co.: *Orzell & Bridges 5920* [TEX]).

Sporobolus silveanus Swallen. Silver dropseed, a rare WGCP endemic, has a dominant presence in Black Branch Barrens on the ANF (Little Bluestem - Nuttall's Rayless Goldenrod Series) (Marietta & Nixon 1984). A few herbarium specimens, listed below, document it for the NFGT. TOES, TNHP, NFGT!

Documentation: (ANF, Angelina Co.: *Nixon & Ward 9659* [ASTC]; Jasper Co.: *Marietta 450* [ASTC]; *Marietta & Nixon 486* [TEX]).

POLYGONACEAE

Eriogonum longifolium Nutt. Long-leaved wild buckwheat is often locally abundant in deep sandy upland longleaf pine savannas and in xeric sandylands (Longleaf Pine - Little Bluestem Series, Blackjack Oak - Pine Series). We have located it at 33 sites. It is very common on the ANF in the Trout Creek and Clear Creek headwaters and on the SNF in the deep sands at San Augustine Sandylands. TOES, TNHP, NFGT!

Documentation: (ANF, Angelina Co.: *Ward & Hupp 374* [ASTC]; *Orzell et al. 7208* [TEX]; Jasper Co.: *Orzell & Bridges 10590* [TEX]; *MacRoberts & MacRoberts 2687* [ASTC]. SNF, San Augustine Co.: *Orzell & Bridges 11152* [TEX]).

Eriogonum multiflorum Benth. Many-flowered wild buckwheat is a species that ranges from northeast México to Oklahoma and western Louisiana. We have located it in two NFGT sites, both in xeric sandylands (Bluejack Oak - Pine Series). One site is near Shearwood Creek just south of the Jasper/Angelina county line and the other is near San Augustine Sandylands. TOES, TNHP, NFGT.

Documentation: (ANF, Jasper Co.: *MacRoberts & MacRoberts 2911* [ASTC]. SNF, San Augustine Co.: *MacRoberts & MacRoberts 3491* [ASTC] *3492* [TEX], *3493* [LSU]).

Polygonella polygama (Vent.) Engelm. & Gray. October-flower, a southeastern species that reaches its western limit in east Texas, is a xeric sandyland species (Bluejack Oak - Pine Series). It is recorded from Nacogdoches, San Augustine, and Smith counties in east Texas (Orzell 1990). There is only one known NFGT site at the San Augustine Sandylands (MacRoberts & MacRoberts 1996a). TOES, TNHP, NFGT!

Documentation: (SNF, San Augustine Co.: *Orzell & Bridges 5912* [TEX]; *Evans s.n.* [SBSC]; *MacRoberts & MacRoberts 2933* [ASTC]).

PORTULACACEAE

Talinum parviflorum Nutt. Small-flowered flame flower, a Great Plains species with limited habitat in WGCP, is known on the ANF only from Black Branch Barrens and Rocky Branch Barrens in Jasper County (Little Bluestem - Nuttall's Rayless Goldenrod Series) (Marietta & Nixon 1984; Orzell 1990). TOES, TNHP, NFGT!

Documentation: (ANF, Jasper Co.: *Marietta 116* [ASTC]; *Brown 9412* [SBSC]).

RANUNCULACEAE

Thalictrum arkansanum Boivin. Arkansas meadow rue, a species found in Texas, Oklahoma, and Arkansas, is known from one NFGT site in the Upland Island Wilderness Area. It occurs in bottomland hardwoods. Park & Festerling (1997) say that *T. arkansanum* is closely related to *T. texanum* (A. Gray) Small and *T. debile* Buckley and possibly should be considered a variety of the latter. TOES, TNHP, NFGT!

Documentation: (ANF, Angelina Co.: *Ward & Brown 1143* [ASTC]).

ROSACEAE

Agrimonia incisa Torr. & Gray. Incised groovebur, a southeastern species with disjunct populations, was not reported in Texas until 1989 (Mahler 1989). It is now recorded from five Texas counties: Anderson, Angelina, Jasper, Newton, and Sabine (MacRoberts & MacRoberts 1997b). Orzell (1990) reported it for two National Forest sites, Singhurst reported it for about ten, and we have found large local populations at about 40 sites (MacRoberts & MacRoberts 1997b). It is found in sandy upland longleaf pine savanna (Longleaf Pine - Little Bluestem Series), notably in the Trout Creek headwaters. TOES, TNHP, NFGT!.

Documentation: (ANF, Angelina Co.: *MacRoberts & MacRoberts 3007, 3113* [ASTC], *3114* [TEX]; Jasper Co.: *Fritz & Ward 8884* [BRIT]; *Orzell & Bridges*

11054 [TEX]; *MacRoberts & MacRoberts 2886, 2896, 2898, 2900, 2910, 2929* [ASTC], *2899* [BRCH] *3242, 3243, 3244* [TEX]. SNF, Newton Co.: Reported by Singhurst [1996]; Sabine Co.: Reported by Singhurst [1996]).

SCROPHULARIACEAE

Buchnera americana L. American bluehearts is an eastern species. It is known from Fox Hunters Hill in southern Sabine County and from Boykin Springs in Angelina County. TOES, TNHP, NFGT!

Documentation: (ANF, Angelina Co.: *Correll & Correll 12568* [SMU]; *Lewis & Oliver 5514* [ASTC]. SNF, Sabine Co.: *MacRoberts & MacRoberts 3367* [ASTC], *3368* [TEX]).

Gratiola flava Leavenworth. Golden hedge-hyssop, a near-endemic of Texas, is known from thirteen counties in Texas but is found only at one location on the ANF (Orzell 1990; Mohlenbrock 1993). Its habitat in south and central Texas appears to be open rocky areas of Black Branch Barrens (Little Bluestem - Nuttall's Rayless Goldenrod Series) (Marietta 1979). TOES, TNHP, NFGT!

Documentation: (ANF, Jasper Co.: *Marietta & Nixon 9* [ASTC]; *Orzell & Bridges 4998* [TEX].

Penstemon murrayanus Hook. Cupleaf beardtongue is a species confined to Texas, Oklahoma, western Louisiana, and Arkansas. It occurs in deep xeric sandy soils (Bluejack Oak - Pine Series). We know it from three sites on the NFGT, one in the Clear Creek headwaters area on the ANF and the other two in the San Augustine Sandylands and the deep sands above Sandy Creek Ravines. TOES, TNHP, NFGT!

Documentation: (ANF, Jasper Co.: *MacRoberts & MacRoberts 2763* [ASTC], *3347* [TEX]. SNF, San Augustine Co.: *Correll 16175* [TEX]; *MacRoberts & MacRoberts 3291* [ASTC]; Shelby Co.: *Orzell & Bridges 5131* [TEX]).

SELAGINELLACEAE

Selaginella arenicola Underw. subsp. *riddellii* (Van Eselt.) R. Tyron. Riddell's spikemoss, a coastal plains species that reaches its western limit in the WGCP, grows in xeric sandylands and on rock outcrops (Little Bluestem - Nuttall's Rayless Goldenrod Series, Bluejack Oak - Pine Series). It is found in both deep sands (*e.g.*, San Augustine Sandylands) and on rock (*e.g.*, Black Branch Barrens). It is known from about ten sites on the NFGT. TOES, TNHP, NFGT!

Documentation: (ANF, Angelina Co.: *Correll 34937* [TEX]; *Orzell & Bridges 10637* [TEX]; Jasper Co.: *Orzell & Bridges 6244* [TEX]; *MacRoberts & MacRoberts 2779* [ASTC]. SNF, Sabine Co.: *MacRoberts & MacRoberts 3376* [TEX]; San Augustine Co.: *Orzell & Bridges 11154* [TEX]; Newton Co.: *MacRoberts & MacRoberts 3370* [TEX]).

XYRIDACEAE

Xyris drummondii Malme. Drummond's yellow-eyed grass, a southeastern species that reaches its western limit in east Texas, is locally common in wet bogs (Sphagnum - Beakrush Series). It is known from Angelina, Newton, and Jasper counties. Orzell (1990) reported it from nine locations, *e.g.*, the Boykin Springs area. We add two locations. TOES!, TNHP!, NFGT!

Documentation: (ANF, Angelina Co.: *Orzell & Bridges 4502* [TEX]; Jasper Co.: *Orzell & Bridges 8280* [TEX]; *MacRoberts & MacRoberts 2902* [ASTC], *3463* [TEX]).

Xyris platylepis Chapm. Tall yellow-eyed grass, a coastal plain species that reaches its western limit in east Texas, is locally scattered in bogs (Sphagnum - Beakrush Series). It is known from Angelina, Sabine, Newton, Jasper, and Tyler counties. TOES, TNHP, NFGT!

Documentation: (SNF, Newton Co.: *Orzell & Bridges 5910* [TEX]; Sabine Co.: *Orzell & Bridges 5906* [TEX]).

Xyris scabrifolia Harper. Rough-leaf yellow-eyed grass, a coastal plain endemic, has been found in Angelina, Jasper, Newton, and Sabine counties. Orzell (1990) reported it from nineteen locations on the ANF and SNF. We add two locations to that list. It is a bog and baygall species (Sphagnum - Beakrush Series, Sweetbay Magnolia Series) and can be found in such areas as Boykin Springs and Upland Island Wilderness. TOES!, TNHP!, NFGT!

Documentation: (ANF, Angelina Co.: *Brown 10616* [SBSC]; *Orzell & Bridges 5633, 8299, 11095* [TEX]; *MacRoberts & MacRoberts 3532* [ASTC]; Jasper Co.: *Orzell & Bridges 8283, 11065, 11077* [TEX]; *MacRoberts & MacRoberts 2637* [ASTC]. SNF, Sabine Co.: *Orzell & Bridges 5648* [TEX].

DISCUSSION

The majority of species on the NFGT list are eastern or southeastern taxa that reach their range limits in east Texas, an indication of a strong affinity between east Texas and the eastern United States. This affinity is reflected in the presence in east Texas of many major eastern plant communities: longleaf pine savanna, beech hardwood forest, and pitcher plant bogs.

The second largest category of plants on the list is Texas and WGCP endemics. These are mostly species of narrow habitat requirements such as *Rudbeckia scabrifolia* and *Tetragonotheca ludoviciana*.

The smallest category is western species that reach their eastern limit in east Texas.

Many species have been described only recently or have only recently been found in the WGCP. *Agrimonia incisa* was found in the late 1980's; *Rudbeckia scabrifolia* was described as a new taxon in 1986; *Palhinhaea cernua* was not found in Texas until 1995. Clearly, there is much to be discovered by surveying for plants in this area, notably about the more problematic taxa that occur in very specialized habitat.

We have recognized in the course of our work that east Texas, like western Louisiana --- the West Gulf Coastal Plain --- is understudied floristically. This was made evident not only by herbarium searches but by discussions with other botanists. We have been able to document all species on the NFGT list with at least one voucher specimen and have been able to document with a voucher specimen 90 percent of the species on the NFGT list to reported county. This rate of success is the consequence of the list being based largely on the work of botanists who collect and put their specimens in herbaria, and our making special trips to find undocumented species. Nonetheless, 10 percent of county records remain undocumented by voucher specimens.

Brown & Brown (1996) and MacRoberts & MacRoberts (1996b) have examined the documentation of species on agency lists and have found that many species or species locations are not documented by vouchers. Because these lists seldom have sufficient annotation, undocumented and documented species are not discriminated, which leads to mistakes when the lists are used as primary data. We recommend that agencies carefully annotate and document their lists so that users will know precisely on what basis a species is listed.

Agencies concerned with endangered, threatened, and sensitive species have ranking systems based on numerical counts of occurrence. Typically, species known from fewer than six sites are ranked as critically imperiled (S1G1); ones with fewer than 21 sites are ranked as imperiled (S2G2), and so on to globally secure (S5G5) or known from 1000 or more sites.

Such a ranking system would seem fairly straight forward until one realizes that sampling methods are never described or discussed. The initial question, therefore, a list-user must ask is have all species been subject to the same sampling methods? The answer, of course, is "no." Some species have been the focus of intensive and prolonged field searches; whereas others are known only from randomly collected herbarium specimens. In other words, totally disparate data collection methods characterize the numerical information on these lists.

The result is an illusion of accuracy. A species that has been the focus of intensive searches and is known from 101 sites (G4S4: "apparently globally secure") is removed from the list; whereas a species known from 20 sites (G2S2: "imperiled globally") but which has never been the subject of any special surveys is retained. The numbers associated with these two species are not equivalent, because the accuracy of our knowledge about them is not equivalent: we may know of every site for one species but have no way of accurately estimating occurrence of the other.

Thus, the bare numbers mean very little. They cannot be taken to mean a species is rare or common until we are given information about sampling methods, or until the numbers have been standardized by some heretofore undeveloped handicapping technique.

Unsurprisingly, focused searches for specific plant species in known habitats usually uncover more locations than were previously known. They reveal not that a species is common, but that it was not looked for previously.

Conservation biology emphasizes the necessity of preserving community (or landscape), not single species: when the community is preserved, the species will take care of themselves. Six communities account for all species listed for the Angelina and Sabine National Forests (Table 1).

Table 1. Communities on ANF and SNF in which rare species occur.

Community	Number of rare species
American Beech - White Oak	14
Mesic Hardwood	3
Longleaf - Little Bluestem	6
Baygall - Bog	17
Blue Jack - Pine	10
Barrens	5

Each of these communities is rare and endangered.

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SPORE PRODUCTION OF MICRO-FUNGAL ISOLATES FROM THE N AND S FACING SLOPES OF EVOLUTION CANYON, LOWER NAHAL OREN, MT. CARMEL, HAIFA, ISRAEL

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ABSTRACT

Eleven micro-fungal species isolated from both the North Facing Slope (NFS) and the South Facing Slope (SFS) of Evolution Canyon, Lower Nahal Oren, Mt. Carmel, Israel were examined for spore formation. Sporulation varied for the same species according to isolates recovered from the NFS, SFS, and carbon sources. *Mucor hiemalis* sexual zygospore production also was monitored.

KEY WORDS: Israel, micro-fungi, spore production, canyon slopes

INTRODUCTION

Much attention has been directed to the soil micro-fungi found in Evolution Canyon, Lower Nahal Oren, Mt. Carmel, Haifa, National Park in Israel. Variations in habitats are evident between the North Facing Slope (NFS) and the South Facing Slope (SFS) as well as the canyon floor (Ellanskaya *et al.* 1997). The diversity of cryptogamic plants and fungi has been studied, in the context of a research program of biodiversity across phylogeny, at the Evolution Canyon microsite. The opposite slopes of Evolution Canyon display dramatic biotic contrasts due to higher (up to 300%) solar radiation on the SFS which is warmer, drier, and climatically more fluctuating than the NFS (Volz *et al.* 1997).

To date, the main focus has been on studies of biodiversity of different groups of higher plants and animals (land snails, scorpions, beetles, ants, fruit flies, reptiles, birds, and rodents) at Evolution Canyon (Nevo 1995). The "tropical" SFS harbors, across phylogeny of plants and animals, an abundance of Asian and African taxa, and is richer in genetic diversity than the "temperate" NFS habitats.

Initial studies of soil micro-fungi in Israel indicated a diverse group of species in rural and urban areas (Volz *et al.* 1992). Dominant species belonged to the genera *Chrysosporium, Gliocladium, Memnoiella*, and *Emericellopsis*. Mount Carmel as well as Akko Park and Kiryat Shoma Park contained high numbers of diverse species in soil samples (Volz *et al.* 1997). Both pathogenic and nonpathogenic species were recovered (Volz & Wasser 1994). Pathogenic species included *Microsporium gypseum, M. ferrugineum*, and *Trichophyton terrestre*. Further investigations revealed frequency of isolation reflected land use habitats unchanged for centuries with well established micro-fungal populations (Volz & Wasser 1995). In Evolution Canyon, species richness was much higher on the NFS than on the SFS. *Aphanocladium album, Cladosporium tenuissimum, Sepedomium chrysospermum, Ulocladium botrytis, Fusarium acuminatum*, and *Phoma exigua* were found on the valley floor and not on either slope.

A combined research program initiative to enhance the knowledge on diversity of mosses, algae, and fungi (including lichens and lichenaceous fungi) was started at Evolution Canyon. Soil micro-fungi studies for this research were focused on interslope systematic, phenotypic, and genotypic diversity comparisons of representative taxa. Particular attention is also being paid to: (a) species present on both slopes; (b) species differing quantitatively on both slopes; and (c) species restricted to one of the slopes (Wasser *et al.* 1995). Interslope divergence of species composition derives from the different solar radiation and results in dramatic physical and biotic differentiation over a very short geographic distance (Lavie *et al.* 1993; Nevo 1995; Wasser *et al.* 1995). The current investigation directs attention to sporulation abundance influenced by micro-fungal species isolation according to the N or S facing slope of the canyon.

MATERIALS AND METHODS

Pure cultures of the test micro-fungal species from the North Facing Slope (NFS) and South Facing Slope (SFS) of Evolution Canyon, Lower Nahal Oren, Mt. Carmel, Haifa, Israel were collected and maintained from soil sampling methods previously described (Kirk & Ansell 1992; Singleton *et al.* 1992; Volz *et al.* 1997). The NFS and SFS isolates included the following species: *Alternaria alternata* (Fries) Keissler (Ellis 1971), *Aspergillus niger* van Tieghm (Raper & Fennel 1965), *Fusarium sambucinum* Fuckel, *Fusarium solani* (Martius) Saccardo (Booth 1971), *Humicola grisea* Traeen (Barron 1968), *Mucor hiemalis* Wehmer (O'Donnell 1979), *Oidiodendron cerealis* (Thuemen) Barron (Barnett & Hunter 1972), *Sordaria fimicola* (Roberge) Cesati & De Notaris (Ellis 1971; Ellis 1976), *Stachybotrys chartarum* (Ehrenberg) Huges (Watanabe 1993), *Staphylotrichum coccosporum* Nicot & Meyer (Gilman 1966), and *Ulocladium consortiale* (Thuemen) Simmons (Watanabe 1993).

Colony spore production of each species isolated from both North and South slopes of Evolution Canyon was monitored for a period of one month for variation in development according to canyon exposure. The Lower Nahal Oren microsite is located at 32° 43′ N 34° 58′ E. The Plio-Pleistocene canyon is about 3-5 million years old, and the two opposite slopes of Nahal Oren share the same geology of limestone and dolomite of the upper Cenomanian geological formation. The two slopes are separated by about 500 m at the canyon top. The opposite canyon slopes show biotic contrasts in species density and diversity due to higher solar radiation on the SFS, which is warmer, drier, and climatically more fluctuating than the NFS (Gutterman & Nevo 1994). Canyons with contrasting south and north slopes are excellent testing models in nature for evolutionary theory and its multiple predictions across life (Wasser *et al.* 1995).

RESULTS

The margin density of conidiophore production for *Aspergillus niger* varied according to NFS and SFS (Figures 1 and 2) isolates from Evolution Canyon. The SFS isolate produced abundant conidiophore and spore production with all carbon sources except for melibiose. No margin conidiophore production was present in the NFS isolate with glucose, citrate, sucrose, rhamnose, inulin, and maltose. Only d-arabinose and melibiose produced equal conidiophore production with both the NFS and SFS isolate. The SFS isolate from worst to best conidiophore production was citrate, lactose, maltose, sucrose, rhamnose, melibiose, d-arabinose, l-arabinose, inulin, and glucose, respectively (Table 1).

For *Mucor hiemalis*, the SFS isolate produced a greater abundance of margin spore production in comparison to the NFS isolate with all sugars except for glucose, sucrose, rhamnose, and maltose. The worst to best carbon source was citrate, d-arabinose, maltose, rhamnose, glucose, and sucrose, respectively. The worst to best sugar for the SFS isolate included lactose, maltose, sucrose, inulin, citrate, d-arabinose, melibiose, rhamnose, glucose, and l-arabinose, respectively.

The asexual spore production for some test micro-fungal isolates indicated that the NFS and SFS were less clearly separated according to site of isolation and growth on carbon source. *Fusarium sambucinum* NFS and SFS isolates produced margin spore and sclerotia equally well on all carbon sources. *Humicola grisea* NFS and SFS isolates produced margin spores on all sugars, while other micro-fungal isolates from the NFS and SFS varied slightly according to species with respect to the NFS and SFS isolates and corresponding carbon sources (Table 2).

The *Mucor hiemalis* NFS isolate initiated zygospore production on all carbon sources earlier than the SFS isolate except for maltose, melibiose, and l-arabinose. With these three carbon sources, zygospore production initiated at the same time for both the NFS and SFS isolates. Sucrose and d-arabinose zygospore production initiated three days earlier for the NFS isolate compared to the SFS isolate. With all other carbon sources, zygospores were present two days earlier in the NFS colonies compared to the SFS colonies (Table 3).

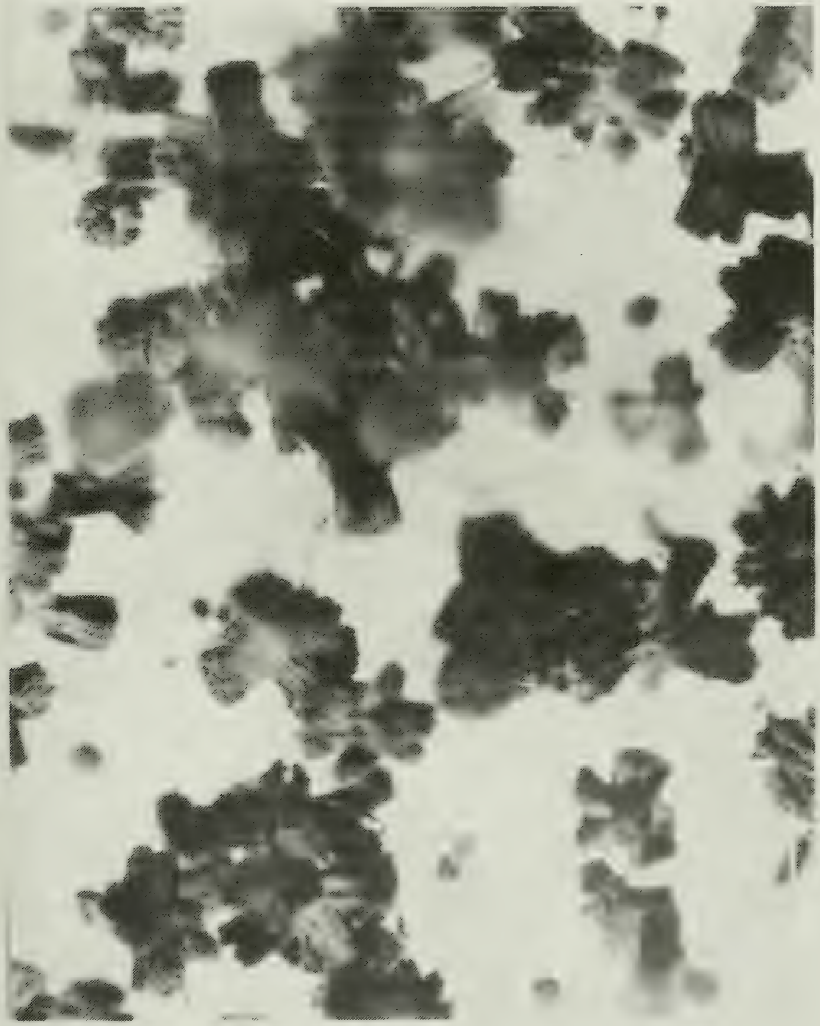

Figure 1. *Aspergillus niger* NFS isolate colony spore production at one month growth at room temperature on SMA. 270x.

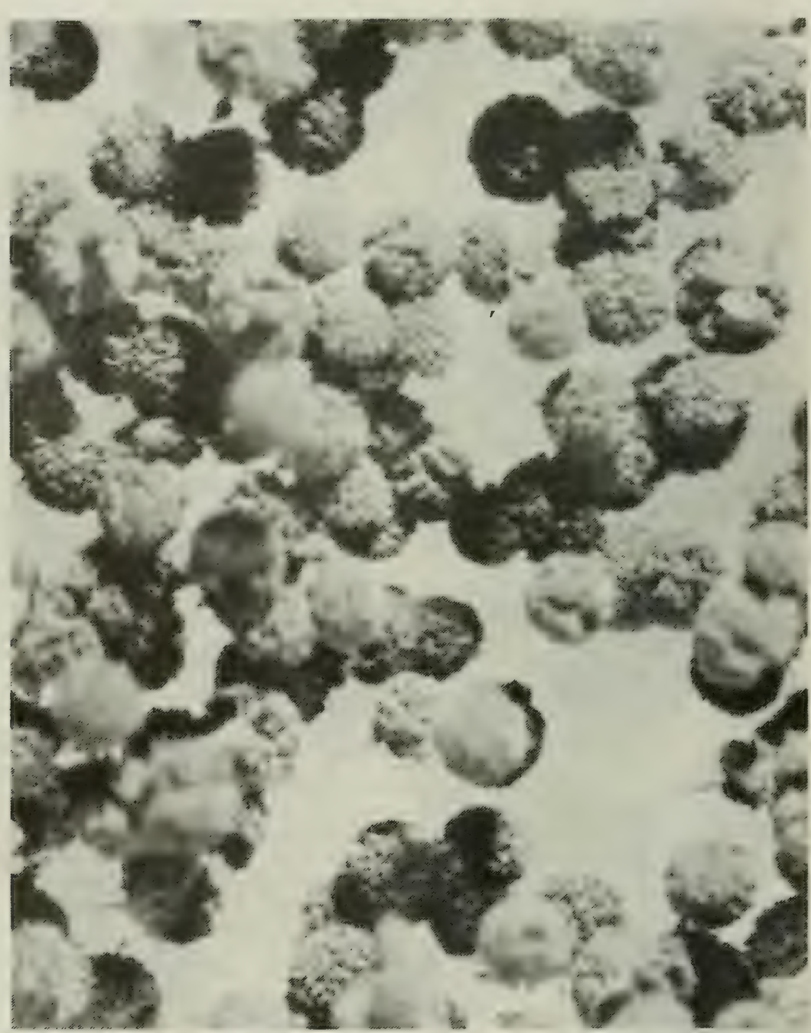

Figure 2. *Aspergillus niger* SFS isolate colony spore production at one month growth at room temperature on SMA. 270x.

Table 1. Spore production of micro-fungi from the NFS and SFS of Evolution Canyon when grown on selected carbon sources. dara = d-arabinose; mel = melibiose; glu = glucose; lara = l-arabinose; lac = lactose; cit = citrate; suc = sucrose; rha = rhamnose; inu = inulin; mal = maltose; + = yes; - = no; s = sclerotia; N = north; S = south; A. = *Alternaria*; F. = *Fusarium*; H. = *Humicola*; O. = *Oidiodendron*; S. = *Sordaria*; St. = *Stachybotrys*; Sa. = *Staphylotrichum*; and U. = *Ulocladium*.

sugar	dara	mel	glu	lara	lac	cit	suc	rha	inu	mal
isolate										
A. alternata S	-	+	+	-	+	+	+	+	+	+
A. alternata N	-	-	+	-	+	+	+	-	-	-
F. sambucinum S	+	+	+	+	+	-	+	+	+	+
F. sambucinum N	+s	+s	+s	+s	+s	-s	+s	+s	+s	+s
H. grisea S	+	+	+	+	+	+	+	+	+	+
H. grisea N	+	+	+	+	+	+	+	+	+	+
O. cerealis S	+	+	+	+	+	+	+	+	+	+
O. cerealis N	+	+	+	+	+	+	+	+	+	+
S. fimicola S	+	+	+	+	-	-	+	+	+	+
S. fimicola N	-	-	-	-	-	-	-	-	-	-
St. chartarum S	+	-	+	+	+	-	+	+	+	+
St. chartarum N	+	-	+	+	-	-	+	+	-	+
Sa. coccosporum S	-	-	-	-	-	-	-	-	-	-
Sa. coccosporum N	+	+	+	+	+	+	+	+	+	+
U. consortiale S	+	+	+	+	+	+	+	+	+	+
U. consortiale N	+	-	+	-	+	-	+	-	-	+

Table 2. Spore density of *Aspergillus niger* and *Mucor hiemalis* from the NFS and SFS of Evolution Canyon when grown on selected carbon sources. dara = d-arabinose; mel = melibiose; glu = glucose; lara = l-arabinose; lac = lactose; cit = citrate; suc = sucrose; rha = rhamnose; inu = inulin; mal = maltose; N = north; S = south; A. = *Aspergillus*; M. = *Mucor*.

sugar	dara	mel	glu	lara	lac	cit	suc	rha	inu	mal
isolate										
A. niger S	55	40	88	59	3	1	21	29	62	10
A. niger N	40	43	-	1	1	-	-	-	-	-
M. hiemalis S	44	46	110	130	17	35	29	60	30	20
M. hiemalis N	17	26	200	40	15	16	200	100	25	90

Table 3. Zygospore production of *Mucor hiemalis* from the NFS and SFS of Evolution Canyon when grown on selected carbon sources. d-ara = d-arabinose; mel = melibiose; glu = glucose; l-ara = l-arabinose; lac = lactose; cit = citrate; suc = sucrose; rha = rhamnose; inu = inulin; mal = maltose; + = yes; - = no.

Day	1	2	3	4	5	6	7	8
South								
d-ara	-	-	-	-	-	+	+	+
mel	-	-	-	-	+	+	+	+
glu	-	-	-	-	-	+	+	+
l-ara	-	-	-	-	+	+	+	+
lac	-	-	-	-	+	+	+	+
cit	-	-	-	-	+	+	+	+
suc	-	-	-	-	+	+	+	+
rha	-	-	-	-	+	+	+	+
inu	-	-	-	-	+	+	+	+
mal	-	-	-	-	+	+	+	+
North								
d-ara	-	-	+	+	+	+	+	+
mel	-	-	-	-	+	+	+	+
glu	-	-	+	+	+	+	+	+
l-ara	-	-	-	-	+	+	+	+
lac	-	-	+	+	+	+	+	+
cit	-	-	+	+	+	+	+	+
suc	-	+	+	+	+	+	+	+
rha	-	-	+	+	+	+	+	+
inu	-	-	+	+	+	+	+	+
mal	-	-	-	+	+	+	+	+

DISCUSSION

In a previous study, the SFS isolates of Evolution Canyon exhibited greater change in colony morphology than the NFS isolates of the same species. For example, the NFS *Alternaria alternata* isolate produced a colony of dense luxuriant growth, grey to tan to black coloration zones, very cottony hyphae, zonate growth of bands dark brown to tan, a flat margin, and a reverse colony which was dark brown to black. The SFS isolate of *Alternaria alternata* appeared to be quite weak, was less pigmented, and had very little colony development. Likewise, for all other micro-fungal species examined, colony morphology and hyphal growth dynamics reflected the area of isolation according to the N or S facing slope of the canyon (Rosenzweig & Volz 1998).

Fusarium sambucinum is a common isolate found in soil habitats (Watanabe 1993). Similarly, the isolate was frequently found on both the NFS and SFS of Evolution Canyon. Members of the *Fusarium* genus easily and freely produce an abundance of micro-conidia of various sizes as well as various cell number per conidium (Gilman 1966). Both *F. sambucinum* NFS and SFS isolates easily produced conidia in the actively growing areas of all colonies when grown on each of the ten test carbon sources, including the control carbon source maltose. Similar to *F. sambucinum*, other micro-fungi found in Evolution Canyon soil also produced asexual conidial spores on all carbon sources used in the study. *Humicola grisea, Mucor hiemalis, Oidiodendron cerealis*, and *Sordaria fimicola* NFS and SFS isolates produced spores on all ten test carbon sources in the young actively growing peripheral margin zone of all colonies. No inhibition of conidial production was noted between isolates found on opposing slopes of the canyon or when the isolates were grown on any of the ten carbon sources. Other canyon micro-fungi yielded varied results, influenced by their slope isolation locality according to individual species. The sporulation was also reflective of the species capability to withstand damaging UV radiation.

Alternaria alternata, a dematiaceous micro-fungal species, freely sporulated when isolated from the SFS of the canyon and grown on most carbon sources. Sporulation occurs when a colony is environmentally challenged and exhibits colony stress. No spores were produced in the colony margin of either the NFS or SFS isolate when grown on d-arabinose or l-arabinose indicating inhibitory effects toward sporulation when grown in the presence of these sugars. Likewise, more frequently *Sordaria fimicola* SFS isolate, *Stachybotrys chartarum* SFS isolate, and *Ulocladium consortiale* SFS isolate generally produced spores on the test carbon sources. Often spores did not form in the actively growing colony margin when the NFS counterpart isolate of the same species was isolated from the opposite more environmentally solar protected canyon slope. Only maltose, a good carbon source for growth and used as the control sugar, initiated spore production for both *Sordaria fimicola* NFS and SFS isolates while no spores were produced when *Sordaria* isolates were grown on citrate, a poor source for growth rates for many micro-fungi.

Conversely, *Staphylotrichum coccosporum* NFS isolate readily produced spores on all ten test carbon sources while no spores were produced in the colony actively growing hyphal zone with the SFS isolate of the same species on the ten carbon species, unanimously opposite to the sporulation patterns of all other canyon micro-fungal species. Environmental stress on the south canyon slope may have been too great for spore production of *S. coccosporum* while the NFS isolate was able to grow and sporulate normally on all carbon sources when subjected to less environmental stress as found on the north slope of the canyon.

Mucor hiemalis, in addition to asexual sporangiospores, readily produced the sexual heterothallic zygospores as well, unlike the remaining deuteromycetous micro-fungi canyon species included in the study capable of forming only conidial spore forms. Sporangiospore production appeared on the second day when the *Mucor hiemalis* NFS isolate colony grew on media with sucrose as the carbon source. NFS isolate colonies produced spores on day 3 or 4 incubation on all other carbon sources. The SFS *M. hiemalis* isolate colonies formed sporangiospores significantly later on the selected carbon sources. For the SFS isolate, spore production occurred on day 5 for most carbon sources, and day 6 for d-arabinose and glucose. Zygospore formation developed on day 2 of incubation using maltose as the carbon source. Maltose even enhanced zygospore production, a process that generally requires more than two days from the time of inoculation of the isolate on the test agar media to the presence of mature zygospores. *Mucor hiemalis* SFS isolate demonstrated enhanced colony development on maltose and inhibited or delayed zygospore development on all other test carbon sources. The delay in zygospore production, except when maltose was used in the agar medium was evident with the SFS isolate, indicating environmental stress on the south canyon slope for the *M. hiemalis* micro-fungal species. Normal development and spore production occurred with the *M. hiemalis* NFS isolate, producing little to no direct light effects for this fungus when grown on the north canyon slope.

Diversity of growth rates, sporulation, and colony development between isolates of the same micro-fungal species collected from the NFS and SFS of Evolution Canyon reflects the diversity of habitats between the opposing slopes separated by only 500 m at the canyon top. The south slope is quite barren, arid, and devoid of vegetation, while the north slope is covered with dense growth of vegetation (Wasser *et al.* 1995). The south slope received up to 300% higher solar radiation in contrast to the cooler and more moist north slope, thus much higher and more intense levels of UV light including the more mutagenic wavelengths of 254, 280, and 300 nm band widths.

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A NOTE ON *PLATANTHERA LACERA* (MICHX.) G. DON (ORCHIDACEAE) IN LOUISIANA

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ABSTRACT

Platanthera lacera (Michx.) G. Don, once considered a part of the Louisiana flora, has recently been excluded from it by a mistaken herbarium annotation. We correct this mistake and reinstate *P. lacera* to the Louisiana flora.

KEY WORDS: *Platanthera lacera*, Louisiana, Orchidaceae

Platanthera lacera (Michx.) G. Don has been considered a part of the Louisiana flora since the mid-nineteenth century (Riddell 1852). More recently, MacRoberts (1977, 1979, 1984, 1989) reported a specimen from Caddo Parish (*MacRoberts 1759* [LSUS].

However, Thomas & Allen (1993:187) excluded *Platanthera lacera* from the Louisiana flora because they were unable to locate a specimen from the state's herbaria.

We examined the Caddo Parish specimen reported by MacRoberts to determine if this exclusion was justified. The specimen proved to be *Platanthera lacera* as originally determined.

What happened is easily explained. In 1977, this specimen was annotated to *Platanthera flava* by A.M. Prigeon (Prigeon & Urbatsch 1977). How this mistake occurred is difficult to understand since the two species are easily distinguished. In any case, this annotation led to Thomas & Allen (1993) excluding it.

Since we are informed that there are no plans at the present time for a correction volume for the Thomas & Allen *Atlas* (D. Moore, pers. comm.), we feel that *Platanthera lacera* should be officially reinstated to the Louisiana flora with a single known voucher specimen and an unverified report of the species from the previous century by Riddell (1852).

The site where this plant was found in 1976 is now a housing development. The nearest known station for *Platanthera lacera* is in Bowie County, Texas (Correll 1947).

ACKNOWLEDGMENTS

David Moore, Louisiana Natural Heritage Program, provided information on the *Atlas* project. R. Dale Thomas and Joe Liggio reviewed the paper and made useful comments.

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TWO NEW SPECIES OF *LEPIDAPLOA* (VERNONIEAE: ASTERACEAE)

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ABSTRACT

Lepidaploa amambaia from Brazil and Paraguay, and ***L. chinchipensis*** from Ecuador are described as new.

KEY WORDS: Asteraceae, Vernonieae, *Lepidaploa*, new species

Material received for identification has led to the recognition of two additional undescribed species of *Lepidaploa.*

Lepidaploa amambaia H. Robinson, *spec. nov.* TYPE: BRAZIL. Mato Grosso do Sul: Rod. MT 642, "20 km L de Amambai" (O?), campo cerrado, 16 Dec 1983, *Hatschbach & Calejas 47289* (HOLOTYPE: MBM; Isotypes: US[2]). PARATYPES: BRAZIL. Goiás: Municipio Jataí, Queixada, campestre, 10 Dec 1948, *Macedo 1459* (US). PARAGUAY: Departamento Amambay, Parque Nacional Cerro Corá, 7 Jan 1988, *Soria & Zardini 1966* (MO, frag. US). Departamento Caaguazu, Arroyo Cambay, northern side, 25° 25′ S 55° 55′ W, cerrado scrub, 12 Jan 1991, *Zardini & Velázquez 25990* (AS,MO,US).

Plantae herbaceae 0.7-1.0 m altae pauce ramosae; caules brunnescentes leniter costati irregulariter puberuli et longe pilosi. Folia alterna, petiolis nullis; laminae oblongae vel leniter oblanceolatae membranaceae plerumque 3.5-6.5 cm longae et 1-2 cm latae margine serrulatae vel denticulatae apice obtusae et argute apiculatae supra dense pilosae subtus subsericeo-pilosae, nervis secundariis utrinque ca. 6 ascendentiter leniter arcuatis. Inflorescentiae in ramis erectis subrectis remote seriato-cymosae, bracteolis minutis apiculatis. Capitula sessilia late infundibularia 8-10 mm alta; bracteae involucri in marginem et costam flavae; bracteae exteriores ca. 30 erecto-patentes anguste subulatae 2-7 mm longae base 0.3-0.8 mm latae valde costatae rigidae apice pungentes extus dense asperulae; bracteae interiores ca. 12, oblongo-lanceolatae, ca. 8 mm longae et 1 mm latae, apice breviter acutae et acuminatae leniter costatae extus asperulae. Flores ca. 12 in capitulo omnino disciformes; corollae lilacinae, ca. 8 mm longae, plerumque glabrae, tubis ca. 4 mm longis superne infundibularibus, faucibus ca. 1 mm longis, lobis ca. 3 mm longis apice dense spiculiferae; thecae antherarum ca. 2.5 mm longae, appendicibuses apicalibus ca. 0.3 mm longis. Cypselae ca. 2.5 mm longae sericeo-setuliferae idioblastiferae, idioblastis numerosis in seriebus brevibus, rhaphidis elongatis; setae pappi albae ca. 7 mm longae apice non lateriores, squamae exteriores lineares ad 1.3 mm longae. Grana pollinis in diametro ca. 40 µm typi G.

Lepidaploa amambaia has been previously identified as *Vernonia oxylepis* Sch.-Bip. *ex* Baker (= *Lepidaploa psilostachya* (DC.) H. Rob., and *Lepidaploa cuiabensis* (Baker) H. Rob. (which has larger heads and more reflexed bracts). However, specimens have most commonly been determined as *Lepidaploa remotiflora* (L.C. Rich.) H. Rob. to which the new species seems to be truly closely related. The related *L. remotiflora* differs most obviously by the smaller size of the heads with more slender spreading outer involucral bracts. The inner involucral bracts are more purplish and have numerous long hairs. The corolla lobes of *L. remotiflora* usually have hairless glanduliferous tips, but some specimens have long hairs. None have been seen with densely scabridulous tips as in *L. amambaia*. A search of *L. remotiflora* specimens has revealed other misidentifications, some inexplicable, such as *L. reflexa* (Gardn.) H. Rob., in the group with type D pollen, and *L. tovarensis* (Gleason) H. Rob., which has *Aynia*-type pollen. The widespread *L. remotiflora*, minus the misidentified material and minus *L. amambaia*, seems comparatively uniform in overall appearance.

Lepidaploa amambaia is distributed mostly along the border area between eastern Paraguay and adjacent south-central Brazil in campo cerrado or cerrado scrub.

Lepidaploa chinchipensis H. Robinson, *spec. nov.* TYPE: ECUADOR. Zamora-Chinchipe: Chinchipe. Parque Nacional Podocarpus, La Esmeralda (cooperativa San Francisco de Numbala Alto), bosque primario "achaparrado" con dosel de 6 m de altura en cresta de colina, 4° 22′ S 79° 03′ W, 2300 m, Jan 1995, *Palacios & Tirado 13064* (HOLOTYPE: US; Isotypes: MO,QCNE).

Plantae suffruticosae vel fruticosae scandentes mediocriter ramosae; caules dense sordide appresse puberuli. Folia alterna, petiolis 4-7 mm longis; laminae subcoriaceae ellipticae 6-7 cm longae 1.5-2.5 cm latae base subacutae margine integrae anguste reflexae apice breviter acuminatae supra atro-virides tenuiter appresse pilosulae in nervulis prominentes subtus dense fulvo-sericeae, nervis secundariis utrinque ca. 6 ascendentiter arcuate patentibus. Inflorescentiae thyrsoideae, bracteis primariis foliiformibus 4-6 cm longis, ramis leniter arcuatis, internodis plerumque 0.5-1.5 cm longis, bracteolis plerumque minutis vel subnullis. Capitula in nodis solitaria vel bina sessilia vel subsessilia campanulata 8-9 mm alta et 5-7 mm lata; bracteae involucri ca. 30, ca. 4 seriatae, 2-5 mm longae, exteriores lanceolatae, interiores anguste oblongo-lanceolatae, omnino extus dense lanulatae. Flores ca. 15 in capitulo omnino disciformes; corollae violaceae 4.5-5.8 mm longae plerumque glabrae, tubis 2.0-2.7 mm longis, faucibus ca. 0.5 mm longis, lobis ca. 1.8 mm longis distaliter dense spiculiferis et minute glanduliferis; thecae antherarum ca. 1.5

mm longae, appendicibus apicalibus ovatae ca. 0.4 mm longis; basi stylorum annulate nodiferi. Cypselae immaturae ca. 1.5 mm longae, dense sericeo-setiferae, dense idioblastiferae parce glanduliferae, raphidis elongatis; setae pappi sordidae ca. 4 mm longae apice vix vel non latiores; squamae exteriores ellipticae vel oblongae ca. 1 mm longae. Grana pollinis in diametro ca. 45 µm typi G.

Lepidaploa chinchipensis is known only from the type specimen collected in primary forest in southern Ecuador. The species is most closely related to the similarly scandent, thick-leaved *L. davidsmithii* H. Rob. from San Martín, Perú (Robinson 1995). The latter species is immediately distinguished by the spreading velutinous pubescence of the stems and the dense, erect, sinuous hairs of the leaf undersurface. The Peruvian species is also rather distinctive in the more scorpioid branch tips, the more regular oblong bracteoles of the branches, the thinner pubescence of the inner involucral bracts, the white pappus and the type C pollen. The new species is notable for the particularly densely sericeous fulvous pubescence of the leaf undersurfaces. The plant is described on the label as an "Arbusto escandente."

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TWO NEWLY RECOGNIZED SPECIES OF *BACCHARIS* (ASTERACEAE: ASTEREAE) FROM MEXICO

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ABSTRACT

Baccharis crassicuneata Nesom, *spec. nov.*, is described from Coahuila, Nuevo León, and Tamaulipas in northeastern México. It is segregated from a broadly treated *B. bigelovii*, the typical portion of which apparently is more closely related to *B. thesioides* and *B. sulcata*. ***Baccharis brevipappa*** (McVaugh) Nesom, *comb. nov.*, is elevated to specific rank from *B. multiflora* var. *brevipappa* McVaugh. This species is morphologically and geographically distinct from *B. multiflora* and intergrades little if any with other taxa of the "*B. multiflora* group." A key is provided to the species of the *B. multiflora* group.

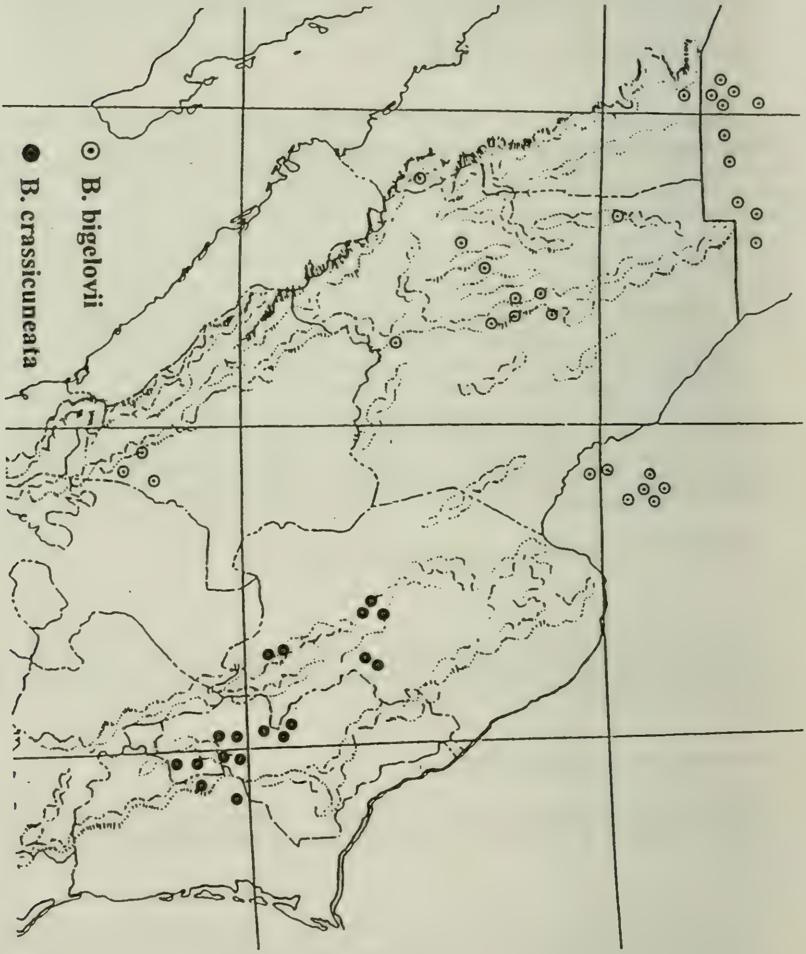
KEY WORDS: *Baccharis*, Asteraceae, Astereae, México

In preparation for a floristic treatment of the Mexican species of *Baccharis*, several taxonomic formalities are necessary, including description of a new species and elevation of another taxon to specific rank.

A new species from northeastern México

Plants from the Mexican states of Coahuila, Nuevo León, and Tamaulipas previously identified as *Baccharis bigelovii* A. Gray are recognized here as a distinct species.

Baccharis crassicuneata Nesom, *spec. nov.* TYPE: MEXICO. Coahuila: Sierra de la Madera, high crest of main ridge about 2 km E of Picacho de Zozaya, 13 Sep 1941, *I.M. Johnston 9034* (HOLOTYPE: LL!; Isotype: GH!).



Map 1. Distribution of *Baccharis crassicuneata* and *B. bigelovii.*

Baccharide bigelovii A. Gray similis sed foliis brevioribus cuneatis dentibus paucioribus, capitulis majoribus, acheniis transversim corrugatis, et pappo valde accrescenti differt.

Dioecious, woody perennials from woody rhizomes, 3-6(-10) dm tall, stems and leaves glabrous and glutinous. Leaves evenly distributed on the stems, the blades thick, papillate, mostly cuneate, 3-nerved with 2 strong laterals diverging from near the very base of the blade, 8-28 mm long, 2.5-14.0 mm wide, 2-4 times longer than wide, abruptly attenuate to the petiolar region 3-7 mm long, margins with 2-7 pairs of teeth on the distal 1/2-2/3, the teeth blunt or with short, sharp, indurate mucros. Capitulescence corymboid to somewhat rounded, produced mostly above the level of the leaves. Phyllaries in 3-5 regularly gradate series, the inner 5 mm long (pistillate) and 3.0-3.5 mm long (staminate), the outermost ca. 1/4 as long, apices acute to rounded. Achenes 2.0-2.2 mm long, 5-nerved, transversely wrinkled, minutely glandular at the base; pappus bristles in 2-3 series, strongly accrescent (pistillate), elongating to nearly twice the length of the involucre.

México: central Coahuila through Nuevo León and into northern Tamaulipas (Map 1); rocky areas (limestone and gypsum), shrubby hillsides or in oak, oak-cypress, pine, or pine-fir forests, 1000-2900 m; Aug-Nov.

Additional collections examined: MEXICO. Coahuila: Sierra de la Madera SE and SSE of Rancho Cerro de la Madera, *Chiang et al. 9438* (LL); ca. 35 air km W of Cuatro Cienegas in Canyon de la Hacienda, Sierra de la Madera, *Henrickson 11884* (LL); Sierra de Gloria, SE of Monclova, *Marsh 1996* (GH); Saltillo, *Palmer 323* (GH); SE of Monclova, *Palmer 537* (GH); 20 mi E of the Ford Clock in Saltillo, Hwy 40, *Smith et al. 782* (LL). Nuevo Leon: Las Placetas, gyp hillside, *Hinton et al. 19822* (TEX, pistillate) and *19823* (TEX, staminate); above 18 de Marzo, pine woods, *Hinton et al. 19802* (TEX); near Río de San José, *Hinton et al. 21517* (TEX); near Río de San José, *Hinton et al. 21567* (TEX); La Poza to Río de San José, *Hinton et al. 21716* (TEX); Dulces Nombres, *Meyer & Rogers 2952* (GH,MO); Mpio. Zaragoza, Cerro del Viejo, 15 mi W of Dulces Nombres, *Meyer & Rogers 3025* (GH,MO); Mpio. Montemorelos, E slope of Sierra de la Cebolla, *Muller 2884* (GH,LL); Monterrey, *C.H. & M.T. Mueller 262* (GH,LL); Mpio. Montemorelos, 6 km SE of La Trinidad, Sierra Cebolla, *Patterson 6142* (TEX); Chipinque, SW of Monterrey, *Pennell 17254* (GH); ca. 31.1 mi W of Linares on hwy toward Iturbide, *Poole 2433* (TEX); 6 mi W of Dieciocho de Marzo, W of Galeana, *Sundberg 3122* (TEX); 6.9 mi N of Galeana on road to San Lucas, *Turner 15567* (TEX); ca. 15 mi NW of Galeana, *Turner & Davies A-48* (TEX-2 sheets). Tamaulipas: Sierra de San Carlos, vicinity of Marmolejo, *Bartlett 10914* (GH,LL); Hidalgo, El Mirador, *Hinton et al. 24647* (TEX).

Baccharis crassicuneata has been identified as *Baccharis bigelovii* A. Gray, but the two species differ in a number of morphological features as well as their geographic distributions. Both, however, are members of *Baccharis* sect. *Aristidentes* Nesom (Nesom 1990), although the new species is unusual in that group in its blunt foliar teeth and minute glands at the base of the achenes.

Baccharis bigelovii occurs in trans-Pecos Texas, southern New Mexico, southeast Arizona, and northeastern México (Chihuahua, Durango, Sonora), its range completely separate from that of *B. crassicuneata.* The distribution of *B. bigelovii* does overlap, however, with *B. thesioides* Kunth and putative intermediates between these two species are sometimes encountered. The difference between *B. bigelovii* and *B. thesioides* lies primarily in leaf shape, other morphological features being essentially identical. *Baccharis sulcata* (including *B. potosina* A. Gray and *B. havardii* A. Gray), which is sympatric with *B. crassicuneata*, forms a third closely related member of the "*B. thesioides* complex" (*B. thesioides*, *B. bigelovii*, and *B. sulcata*), which is distinct as a unit from *B. crassicuneata.*

The newly recognized species can be morphologically distinguished from *Baccharis bigelovii* by the following contrasts.

1. Leaves dark green, glutinous, the blades mostly cuneate, 8-28 mm long, 2.5-14.0 mm wide, 2-4 times longer than wide, the margins with 2-7 pairs of teeth on the distal 1/2-2/3; pistillate involucres ca. 5 mm long, staminate involucres 3.0-3.5 mm long; phyllaries oblong to oblong-oblanceolate or oblong-lanceolate; pappus strongly accrescent to ca. 8 mm long at maturity, nearly twice the length of the involucre; achene surface transversely wrinkled at maturity......... *B. crassicuneata*

1. Leaves yellow-green, usually not evidently glutinous, the blades obovate to broadly oblanceolate, 24-40 mm long, 4-16 mm wide, 2.5-6.0 times longer than wide, the margins with 6-11 pairs of teeth on at least the distal 3/4; pistillate involucres ca. 4 mm long, staminate involucres 3.5-4.0 mm long; phyllaries lanceolate; pappus ca. 3.5 mm long at maturity, ca. the same length as the involucre; achenes relatively smooth-surfaced at maturity.. *B. bigelovii*

The *Baccharis multiflora* group and a new combination

The *Baccharis multiflora* group, as delimited here (see key below), includes *B. multiflora* Kunth, *B. brevipappa* (McVaugh) Nesom (see below), *B. zamoranensis* Rzed., *B. serrifolia* DC., *B. sordescens* DC., and *B. mexicana* Cuatr. These entities form a major portion of the group described by Nesom (1990) as *Baccharis* sect. *Aristidentes* --- the other species of the section are *B. palmeri* Greenm., *B. plummerae* A. Gray, *B. crassicuneata*, and those of the *B. thesioides* complex. Sect. *Aristidentes* is characterized by leaves with papillate punctations, margins closely serrulate, usually with aristate teeth, pedicellate heads in a corymboid capitulescence, and eglandular achenes with 5(-6) relatively thick ribs. Within the section, the *B. multiflora* group is recognized by an erect but weak-stemmed habit and the production of crinkly, viscid, usually reddish-brown hairs.

McVaugh (1972, 1984) recognized three varieties within *Baccharis multiflora* – var. *multiflora*, var. *brevipappa* McVaugh, and var. *herbacea* McVaugh. The status of var. *herbacea* remains to be investigated more thoroughly (comments below); morphology and geography indicate that var. *brevipappa* warrants recognition at specific rank.

Baccharis brevipappa (McVaugh) Nesom, *comb. nov.* BASIONYM: *Baccharis multiflora* Kunth var. *brevipappa* McVaugh, Contr. Univ. Michigan Herb. 9:363. 1972. TYPE: MEXICO. Jalisco: headwaters of R'o Mascota S of El Rincón, 20-25 km SE of Talpa de Allende, 1700-1900 m, 3-4 Apr 1965, *R. McVaugh 23463* (HOLOTYPE: MICH).

Weak-stemmed, subscandent shrubs; leaves lanceolate-elliptic to narrowly elliptic or oblong-elliptic, (4-)8-13 cm long, 1-3 cm wide, 4-6(-8) times longer than wide, pinnate-veined, rarely 3-nerved; staminate heads 3.0-3.5 mm long; pistillate heads 3.5-4.5 mm long, with the pappus 2.5-4.5 mm long; phyllaries rarely purple-tipped.

México: Durango, Zacatecas, Jalisco, Aguascalientes, and Michoacán (Map 2); oak, pine, pine-fir, or fir forests, at elevations of 1300-3000 meters; flowering March through April (to November in Durango).

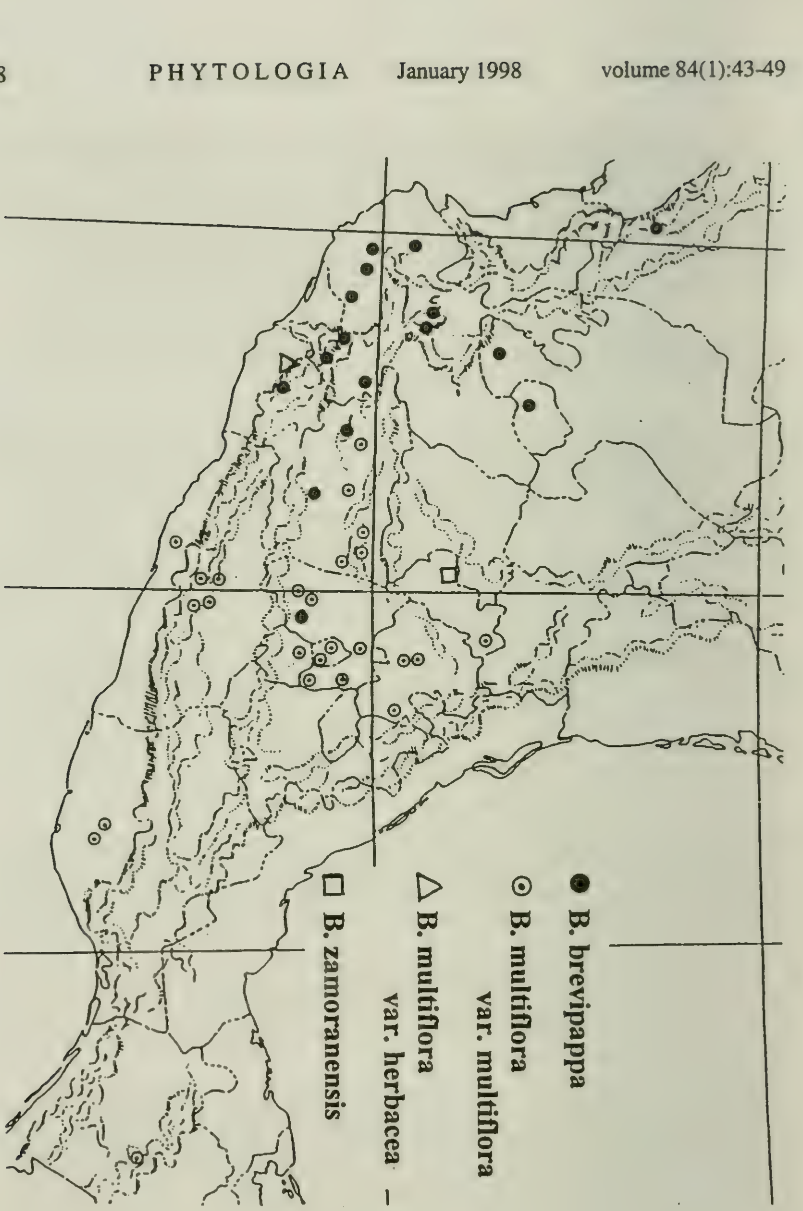
These plants differ from *Baccharis multiflora* in their subscandent habit and relatively diffuse inflorescence (more similar to *B. serrifolia*), longer leaves, smaller heads with barely accrescent pappus, and in their separate geographic range. The range of *B. brevipappa* closely approaches that of *B. multiflora* in northern Michoacán and the two species are sympatric in western Edo. México, where intermediates apparently are rare or none. The features of *B. brevipappa* were noted and discussed by McVaugh (1972, 1984); the difference here in interpretation of its taxonomic rank stems from study of the whole *B. multiflora* group and a species concept consistent with that applied to other species of Mexican *Baccharis*.

Several *Baccharis* collections from central Guerrero are similar to *B. brevipappa* in their relatively long leaves (5-7 cm long) averaging 4-5 times longer than wide, and their relatively small staminate heads (3.0-4.5 mm long). In contrast, the erect habit and corymboid inflorescence, the longer pistillate involucres (5.0-5.5 mm long), purplish phyllaries, and the longer pistillate pappus (6 mm) are more like *B. multiflora*, as these collections have been identified here.

Baccharis multiflora Kunth var. *herbacea* McVaugh, Contr. Univ. Michigan Herb. 9:364. 1972. TYPE: MEXICO. Michoacán: Coalcomán, pine-fir forests on limestone, near summits ca. 25 km SW of Aserradero Dos Aguas, nearly W of Aguililla, 2400-2500 m, 6 Mar 1965, *R. McVaugh 22846* (HOLOTYPE: MICH; Isotype: LL!).

Erect, rhizomatous subshrubs up to 1 m tall, stems and leaves sparsely pilose-puberulent with brownish, viscid hairs; leaves thin, with a raised reticulum of veins, elliptic, 2-4 times longer than wide; capitulescence a relatively few-headed corymb; mature pistillate pappus 6-7 mm long.

As described by McVaugh, var. *herbacea* is known from only the type collection (the type locality imbedded within the range of *Baccharis brevipappa*, Map 2), although similar plants have been collected in Hidalgo and Durango. It is related to *B. brevipappa* and *B. multiflora* but distinct from both of them. If further collections show the morphology of var. *herbacea* to be constant, this entity warrants recognition at specific rank. In the forthcoming floristic treatment, it is tentatively maintained in McVaugh's placement at varietal rank within *B. multiflora*.


● B. brevipappa
⊙ B. multiflora var. multiflora
△ B. multiflora var. herbacea
□ B. zamoranensis

Map 2. Distribution of *Baccharis brevipappa*, *B. multiflora*, and *B. zamoranensis*.

Key to the species of the *Baccharis multiflora* group

1. Stems and leaves essentially glabrous, usually heavily glutinous........ *B. mexicana*
1. Stems and leaves distinctly hairy, usually not glutinous. ....(2)
    2. Leaves thickly puberulous, with prominent, abundant, sessile resin droplets, these especially visible on the lower leaf surfaces................. *B. sordescens*
    2. Leaves variably pubescent but without prominent, sessile resin droplets (3)
3. Leaves lanceolate-elliptic to narrowly elliptic or oblong-elliptic, (4-)7.5-13 cm long, 3.5-6.0(-8) times longer than wide, pinnate-veined; staminate heads 3.0-3.5 mm long; pistillate heads 3.5-4.5 mm long; pappus 2.5-4.5 mm long; phyllaries usually not purple-tipped.. *B. brevipappa*
3. Leaves elliptic, 2.5-5.0(-8) cm long, 2.0-3.5(-5) times longer than wide. ....(4)
    4. Phyllaries not purplish; staminate heads 2.5-4.0 mm long; pistillate heads 4.5-5.0 mm long, with mature pappus 4-5 mm long. ....*B. serrifolia*
    4. Phyllaries usually purplish, at least distally. ....(5)
5. Leaves glabrous, distinctly 3-nerved, with indistinct petioles, toothed only on distal half of margins; staminate heads 3-4 mm long; pistillate heads 4-6 mm long, with mature pappus 4-5 mm long... *B. zamoranensis*
5. Leaves puberulent at least on the lower surfaces, pinnate- to 3-nerved, with distinct petioles 5-10 mm long, margins toothed from well below the middle; staminate heads 4.5-5.5 mm long; pistillate heads 6-8 mm long, with mature pappus 6-8 mm long...*B. multiflora*

ACKNOWLEDGMENTS

Thanks are extended to the staff of LL,TEX for their help during recent visits. Studies of Mexican *Baccharis* have been made from specimens at ARIZ, BRIT, CAS, GH, MEXU, MO, US, WIS, and others. Billie Turner (TEX) and Jim Massey (NCU) reviewed the manuscript.

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Phytologia (January 1998) 84(1):50-52.

TWO NEW SPECIES OF *ARCHIBACCHARIS* (ASTERACEAE: ASTEREAE) FROM MEXICO

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ABSTRACT

Two new species of *Archibaccharis* collected by Dennis Breedlove and Frank Almeda are described from southern México: ***A. breedlovei*** Nesom & Turner from three collections in central Oaxaca and ***A. almedana*** Nesom from a collection on the northwest slope of Cerro Tlacotepec in central Guerrero. The main features and relationships of each species are discussed.

KEY WORDS: *Archibaccharis*, Asteraceae, Astereae, México

Archibaccharis breedlovei Nesom & Turner, *spec. nov.* TYPE: MEXICO. Oaxaca: Steep slope with *Quercus* and *Cupressus*, 6.5 km E of the Mitla – Choapam road along road to Zacatepec, N slope of Cerro Zempoaltepetl, 2285 m, 26 Sep 1986, *D.E. Breedlove 64695* with F. Almeda (HOLOTYPE: CAS *fide* Turner; Isotype: TEX!).

Archibaccharide caloneura Blake similis foliis rigide chartaceis ac venatione valde reticulata elevata utrinque sed habitu subscandenti, capitulescentiis terminalibus ac axillaribus, capitulis floribus paucioribus, caulibus absque pigmento purpureo, et floribus staminatis ramis stylaribus ovati-deltatis trichomatibus crassis patentibus differt.

Subscandent shrubs, stems slightly zig-zag, moderately hairy with persistent (at least the bases), spreading hairs 0.2-0.3 mm long with conspicuous crosswalls, eglandular. Leaves dark green, stiffly coriaceous with a distinctly raised reticulum of veins on both the upper and lower surface, with 7-9 main lateral veins from the midvein, glabrous except for the main veins, eglandular, elliptic-ovate with a short-acuminate apex and rounded base, the larger mostly 8-12 cm long and 3-4 cm wide, petiole 4-5 mm long, margins coarsely but shallowly serrate with long-mucronate teeth. Heads numerous in terminal and axillary corymboid panicles, the ultimate peduncles mostly 2-7 mm long. Pistillate heads with 11-15 pistillate flowers and 1-3 central (sterile) disc flowers; phyllaries oblong-elliptic with rounded apex and fringedciliate margins, in 3-4 graduate series, the inner 3-4 mm long; pistillate flowers fertile, the corollas tubular-filiform, 3.0-3.5 mm long, hairy, eligulate; central flowers with sterile ovaries, the corollas ca. 4 mm long, the tube 2.5 mm long, densely hairy with viscid trichomes, the lobes white, turning purple, 1.3 mm long, cut nearly to the tube, the style branches 0.8 mm long, with elliptic-ovate appendages 0.5 mm long. Staminate heads with 9-11 flowers; flowers as described for central flowers of pistillate heads but producing fertile pollen. Achenes 1.8-2.0 mm long, flattened, with 3-4 thick nerves, sparsely invested with sessile or short-stipitate glands scattered over the surface; pappus of numerous bristles in 1-2 series. The branches of the holotype and *Breedlove 72386* are staminate; those of *Breedlove 60006* are pistillate.

Additional collections examined: MEXICO. Oaxaca: steep slope with *Quercus*, *Pinus*, and *Clethra*, NE slope of Cerro Humo Chico, 2440 m, 9 Nov 1983, *Breedlove 60006* with Almeda (CAS *fide* Turner, TEX); NNE slope of Cerro Humo Chico, 2440-2740 m, 29 Oct 1991, *Breedlove 72386* with Mahoney (CAS *fide* Turner).

Archibaccharis breedlovei is superficially similar to *A. caloneura* Blake in its thick, shiny leaves with acuminate apices, serrate margins, and a strongly raised reticulum of veins on both surfaces. In contrast, *A. breedlovei* is more viney and bears both terminal and axillary capitulescences (vs. terminal only) that are smaller and more rounded; it produces fewer-flowered heads (9-11 staminate/12-18 pistillate vs. 24-36 staminate/22-28 pistillate) (see Jackson 1975), stems without purple pigmentation, and ovate-deltate staminate style branches with thick, spreading sweeping hairs.

The closest relationship of *Archibaccharis breedlovei* appears to be with the species of *Archibaccharis* sect. *Stylosa* Nesom (Nesom 1991), which are particularly characterized by thick staminate style branches with thick sweeping hairs. These species also have a subscandent habit and relatively thick leaves but none has the strikingly raised reticulum of veins of *A. breedlovei.*

Archibaccharis almedana Nesom, *spec. nov.* TYPE: MEXICO. Guerrero: Ridge with *Pinus*, *Quercus*, *Clethra*, and *Cleyera*, W of Puerto El Gallo along road to Toro Muerto, 2530 m, 9 Oct 1986, *D.E. Breedlove 65071* with F. Almeda (HOLOTYPE: TEX!).

> *Archibaccharide nephocephala* Nesom similis habitu strictu et capitulescentia terminali grandi sed conspicue differt vestimento tenui arcte adpresso (vs. villoso vel hispidi-piloso) et capitulis majoribus (2.2-2.6 mm longis vs. 1.5-2.0 mm longis).

Erect shrubs, stems to 2 m tall, straight, thinly and closely pubescent with minute appressed hairs, eglandular. Leaves dark green, ovate-elliptic with a short-acuminate apex and shallowly serrate margins, the blades thin (not coriaceous), 8-12 cm long and 3.0-4.5 cm wide, basally attenuate to a narrow petiole 12-18 mm long, the upper surfaces glabrous and shiny, lower surfaces sparsely hairy on veins and lamina with minute appressed trichomes and with a reticulum of dark-colored imbedded veins. Heads numerous in terminal, dense, somewhat elongate panicles. Pistillate heads and achenes not seen. Staminate heads 3 mm wide with 20-22 flowers, the ovaries sterile; phyllaries oblong-lanceolate, in 3-4 graduate series, the inner 2.2-2.6 mm long, the margins thinly pilose-ciliate, with a few hairs on the lamina; corollas white, 2.4-2.5

mm long, the tube 1.2 mm long and sparsely hairy, with lobes cut $3/4$ to the tube; style branch appendages ovate-lanceolate, 0.6-0.8 mm long, with spreading sweeping hairs. The holotype bears only staminate branches.

The tall, primarily erect habit and the staminate style branch morphology of *Archibaccharis almedana* indicate that it is most closely related to the species of sect. *Tomentosa* Nesom: *A. nephocephala* Nesom, *A. peninsularis* Blake, and *A. serratifolia* (Kunth) Blake. The general appearance of *A. almedana* is closest to *A. nephocephala*, particularly in their massive and dense, terminal capitulescence, although the heads are larger in the new species (2.2-2.6 mm long vs. 1.5-2.0 mm long). The leaves and stems of *A. almedana* also produce a minute, close, and inconspicuous vestiture in contrast to the villous to hispid-pilose vestiture of *A. nephocephala* (and the tomentum for which the section is named) and the style branches of the new species are the longest among this group, but there apparently is no better choice for its infrageneric placement.

Archibaccharis almedana was collected from the area of high elevation in central Guerrero, apparently on the northwest slope of Cerro Tlacotepec, with Cerro Teotepec and Cerro El Gallo also in the close vicinity. Four other species of *Archibaccharis* apparently occur in this area: *A. asperifolia* (Benth.) Blake, *A. schiedeana* (Benth.) J.D. Jackson, *A. serratifolia*, and *A. simplex* (Blake) Blake, and it is likely that *A. auriculata* (Hemsl.) Nesom and *A. hirtella* (DC.) Heering also may be found there.

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Phytologia (January 1998) 84(1):53.

NEW NAMES IN THIS ISSUE OF PHYTOLOGIA

As a result of the International Botanical Congress in Tokyo in 1993, the International Association of Plant Taxonomy has been tasked with exploring the feasibility of registration of plant and fungi names. In accordance with terms of the pilot implementation of the registration concept, new names and combinations produced in this issue of PHYTOLOGIA are listed below.

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Lepidaploa amambaia H. Robinson	40
Lepidaploa chinchipensis H. Robinson	41
Baccharis crassicuneata Nesom	43
Baccharis brevipappa (McVaugh) Nesom	46
Archibaccharis breedlovei Nesom & Turner	50
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The editor expresses his most sincere appreciation to the following individuals. These are persons who have reviewed papers that were submitted for publication in volume 83 of Phytologia. Without the willingness and diligence of these reviewers, the task of the editor would be much more difficult, and the quality of the papers published would be lessened. To each of you, I offer my most sincere thanks.

Michael J. Warnock, Editor

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83(6)	December 1997	02 November 1998

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DISPOSITION OF MANUSCRIPTS, VOLUMES 82 AND 83

Manuscripts listed below include those received after examination by two or more reviewers. A note of appreciation to reviewers for volume 82 is found on page 80 of volume 83, and for volume 83 on pages 54-55 of volume 84, with the lists of reviewers. Manuscripts received without review are not considered for publication until review has been completed.

Manuscripts received: 90

Manuscripts accepted without revision: 24

Manuscripts accepted after revision: 47

Manuscripts returned to authors without publication: 12

Manuscripts currently under revision: 7

Manuscripts currently accepted but not yet published: 6

Papers published: 65

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